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HOME FLORICULTURE
IN CALIFORNIA


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HOME FLORICULTURE IN CALIFORNIA

H. M. BUTTERFIELD¹

Floriculture may be defined as the growing of plants for ornamental purposes, especially for flowers. This circular will deal only with the growing of flowers about the home. Special emphasis will be given to the questions which the home gardener asks, such as what flowers to select, when to plant, and how to successfully grow flowers in California home gardens.

California has a wide variety of soils and climates, so it is not strange that home gardeners should be growing flowering plants, both hardy and subtropical, from all over the world. The possibility of adding new varieties of flowers from Africa, Australia, China, and other countries is still open to many sections of California. With such a large variety of plant material, the beginner may be at a loss to know what to select. Such a publication as this cannot cover all the flowers being grown; only the more popular and more promising will be specifically mentioned. The reader who desires additional information should find the references listed in connection with the various flowers very helpful. There are also a few reference books dealing at length with flower growing specifically under California conditions.²

The beginner will need to know something about the climate and soils of California. A brief discussion of these topics is therefore included. Lists of plants for special purposes and a planting calendar are given to aid him in selecting flowers and planning his work. Since there is a great similarity in the propagation of different flowering plants from seeds or from vegetative parts, one section is devoted to general methods of propagation.

More specific and detailed hints on propagation, and also on selection of varieties, cultivation, and care, are given for the flowers and ornamentals most important in California. In order that the reader unfamiliar with names may more readily find the type of plant in which he is interested, these hints are grouped into such classes as annuals, herbaceous perennials, flowering bulbs, deciduous shrubs and trees, and evergreen flowering climbers, according to the habit of growth of the plant concerned. The index at the back may prove helpful in locating the discussion of a particular plant.

¹ Supervisor of Correspondence Courses in Agriculture.

² Mitchell, S. B. *Gardening in California*. 323 p. Doubleday Doran Co., Garden City, N. Y. 1923. Wickson, E. J. *California garden flowers, shrubs, trees, and vines*. 3rd. ed. 259 p. Pacific Rural Press, San Francisco, California. 1926.

The system of nomenclature used in this circular follows, except in a few minor details of spelling, that used in Bailey's *Cyclopedia of American Horticulture* and *Manual of Cultivated Plants*.³ Common names are given wherever they are available and better known than the botanical name.

A general discussion of plant diseases and pest control is beyond the scope of this circular.⁴ However, special mention will be made of certain pests and diseases in connection with the practical hints offered on the popular flowering plants. Every gardener should be equipped with a good sprayer and should be familiar with certain spray materials which are giving successful control. He should realize that there is often a proper time to apply control measures if success is to be had. Prevention may be the only method available in some cases. Preparedness made possible by adequate information beforehand should reduce plant disease and pest troubles to a minimum.

CLIMATIC DIVISIONS OF CALIFORNIA

California's mountain ranges run north and south and the warm Japan current near the coast tends to give the whole Pacific Coast rather mild winters. The summers near the coast are cool owing to the trade winds off the coast. The Sierra Nevada range reaches an elevation of over 14,000 feet, which explains why the mountainous parts of the state require hardy ornamentals; in fact the higher mountains are similar to the eastern states in many ways. The foothills of the Coast Range and inland valleys have such good air drainage and are so affected by the north and south direction of the mountain ranges that some very mild climatic conditions prevail throughout the length of the state, as evidenced by tender citrus trees in Butte, Sacramento, Sonoma, Alameda, Santa Clara, Fresno, Tulare, and the eight southernmost counties making up what is called southern California.

In general the winters of California are comparatively mild in the thickly inhabited sections. Most districts are free from excessive sum-

³ Bailey, L. H. *Cyclopedia of American horticulture*. 3 vol. 3639 p. Macmillan Co., San Francisco. 1928.

Manual of cultivated plants. 851 p. Macmillan Co., San Francisco. 1924.

⁴ The following publications may be of interest in connection with plant diseases and pest control:

Horne, W. T., E. O. Essig, and W. B. Herms. *Plant disease and pest control*. California Agr. Exp. Sta. Cir. 265:1-144. 1930.

Weigel, C. A. *Insect enemies of the flower garden*. U. S. Dept. Agr. Farmers' Bul. 1495:1-54. 1926.

Weigel, C. A. *Insects injurious to ornamental greenhouse plants*. U. S. Dept. Agr. Farmers' Bul. 1362:1-80. 1924.

mer heat. Irrigation water is available in nearly all parts of the state, so drouth is not usually a serious factor. The summers are typically rainless and the nights cool. The rainy season comes mostly between September and April. These climatic conditions along with fertile soil make it possible to grow many tender plants, some of which demand a rest during the summer. Most of the Cape bulbs from South Africa prefer dry summers. But other plants like the rhododendrons, azaleas, and Holland bulbs do best in deep, fertile, well-drained soils, such as are found in the north coastal area, where the

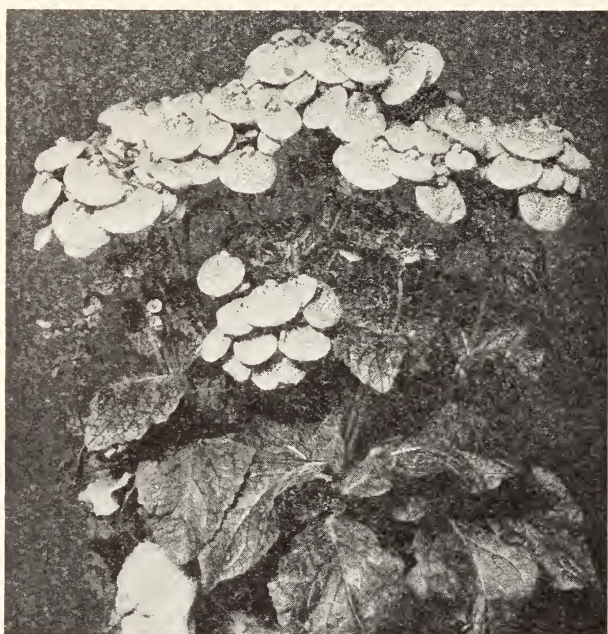


Fig. 1.—The hothouse calceolaria is an excellent flower for the home gardener with the proper equipment. Shrubby species are hardy outside in parts of California. (Photograph by courtesy of Western Homes and Gardens.)

rainfall is heavy and the plants are supplied with plenty of moisture throughout the year. The gardener in Humboldt County might specialize in growing true lilies, Holland bulbs, and rhododendrons, while the gardener in San Diego County might find the mild weather and dry summer best adapted to the Cape bulbs or other plants like *Iris susiana* which need a summer rest.

Temperatures are in part associated with the amount of sunshine present. A mean annual temperature of 55° Fahrenheit along the coast in central California is not injurious to plants like the shrubby calceolarias (fig. 1), the English holly, many ferns, and camellias, but

there is a large group of ornamentals that need more heat to do well. More sun and heat during the summer will be needed by such plants as: crape myrtle (*Lagerstremia*), poinsettia, Transvaal daisy (*Gerbera*), jacaranda, camphor tree, orange tree, Cocos palm, tropical water lilies, and zinnias. Light, as well as heat, will be needed in some cases, as studies on light and shade requirements have demonstrated. When studying the various climatic divisions of California it will be well to hold these limitations in mind.

Subtropical Area.—This includes the coast section of California from Santa Cruz south to the southern border of the state and inland through all of the citrus belt. The citrus districts in central and northern California will be included, except when considering the very tender subtropical plants, especially those which are injured by a very hot sun or a very dry atmosphere, also excepting those subtropicals which require an abundance of winter heat. In these special cases a more careful selection should be made within this general area to meet the individual plant requirements. The cool subtropicals will be limited to the coastal districts where the air is not too dry. Those subtropicals which require a large amount of heat during the growing season will be best adapted to the frost-free foothill districts back from the coast.

North Coast Area.—This area includes that part of the state west of the Coast Range from Santa Cruz to Oregon, often known as the Redwood Belt. The summers are dry with frequent fogs. Winter rainfall is heavy. Winter temperatures are down to freezing or a few degrees below except near the coast and bays. The true lilies, Holland bulbs, azaleas and rhododendrons, hardy perennials, and moisture-loving plants are at their best here.

Interior Valley Area.—This area includes the major portion of the San Joaquin and Sacramento valleys, excepting the part affected by the San Francisco Bay and adjacent bodies of water; citrus areas are also excluded. The winters seldom reach lower than 22° to 24° Fahrenheit. Rainfall ranges from about 10 to 20 inches. This area is suited to hardy annuals and perennials which tolerate summer temperatures of 90° to 110° Fahrenheit, such as columbines, chrysanthemums, sunflowers, zinnias, irises, and many of the Cape bulbs; also cannas, oleanders, and various drouth-resistant plants mentioned on page 36.

Desert Area.—This area contains all of the inland sections directly affected by the Mojave and Death Valley deserts. The Coachella and Imperial valleys will come mostly in this district. The name should

not lead anyone to think that the gardens are limited to a desert flora. Irrigation water is available in many parts of the area. On the other hand, water will be a limiting factor for most cultivated ornamentals. Some of the drouth-resistant plants that come from Australia and Africa should be considered in planting lists. The athel (*Tamarix articulata*) is a good example of a tree that has succeeded in this section. Sunflowers, gaillardias, heleniums, irises, and other flowering plants which bloom early, before the hot summer weather comes on, will usually do well.

Mountain Area.—This portion of California contains all of the higher mountain areas where the winters are accompanied by snow and freezing weather and usually by late spring frosts. The alpine plants (see p. 37) should find a home here, and in addition the hardier plants like the lilac, which are popular in the East. Nearly all the annuals, hardy perennials, and deciduous shrubs should be considered. Tulips have done well in places, and peonies might be tried. Those plants which need a distinct rest period, such as the common lilac, and possibly the flowering peach, should be at home in this area.

THE LOCAL SITUATION

In addition to the variation in climatic divisions of California there will be some variation within each of the divisions and more particularly within a single locality or in a single garden. The local situation has more to do with the success of the home garden than any of the more general conditions which have been discussed. There is often a wide range in sunlight, temperature, air currents, and possibly moisture in the same garden. The success of certain plants will depend on selecting a suitable location or a suitable exposure. A rose that mildews badly when planted against a shady wall may be relatively free from such trouble when planted in the open part of the garden. Conditions within a garden rarely remain stationary. Trees and shrubs increase in size and the number of such plants may also be increased from time to time, thus affecting the surrounding flowering plants. Buildings are sometimes added which also affect the local exposure of the plants.

Local differences in exposure to salt air, winds, or frost affect the success of the garden. An unfavorable situation or exposure can often be gradually modified; a windy exposure, for example, can be modified by planting windbreaks which will give the desired protection. In the beginning it may be important to select plants that will tolerate the unfavorable situation. *Rosa rugosa* and *Lavatera assurgentiflora*

(tree mallow) are known to resist salty air. *Echeveria* and *Dudleya* species grow on sea cliffs swept by strong winds. Several of the ice plants (species of *Mesembryanthemum*) have been used to cover hot sunny banks where moisture conditions were variable. The Australian tea tree (*Lepstospermum levigatum*) and the athel (*Tamarix articulata*) have been used to bind blow sands. These two plants are also resistant to alkali. Planting lists for special environments will be found on pages 35 to 38. Nursery catalogues should also be consulted as to sensitiveness of the subtropical plants to frost. Some of the recently introduced subtropical flowering shrubs and trees will not only be limited as to winter temperatures but they may require a large amount of heat during the growing season as well. Such plants will do well in many of the frost-free areas of southern California as far north as Santa Barbara but only occasionally in the gardens farther north, because there are few spots that have a combination of high winter temperature and a large number of heat units during the growing season. Gardeners may need to test out their local situation to see how well adapted it is for these tender plants.

GARDEN SOILS

Classes of Garden Soils.—California garden soils range from heavy sand and gravelly loams to the stiff clay soils. Most sandy loams and light clay loams work easily, retain their moisture fairly well, yet are well drained at all times. The loam soils generally need some fertilizing and the sandy soils are generally very deficient in organic matter. The very heavy clay soils not only are hard to cultivate but the period during which they can be cultivated satisfactorily is also normally limited. The term ‘adobe’ is often used to mean a heavy clay soil that is difficult to work and cracks badly on drying but it is really not a term describing a particular soil type, but rather covers a condition that may occur with any of several soil types. A sandy loam that cracks badly on drying is called a sandy adobe loam.

Alkali Soils.—Parts of California are troubled with excessive amounts of alkali salts in the soil. These alkali salts may accumulate because of poor drainage and evaporation of soil moisture from the surface, or the irrigation water may contain considerable amounts of the salts. These various salts are mostly compounds of sodium. Sodium carbonate is called ‘black alkali’ and the other sodium salts such as sodium chloride, sodium sulfate, and sodium nitrate are called ‘white alkali’. In regions with much rainfall these salts are carried away in the drainage, but in very dry climates there is a tendency for the

alkali to accumulate. The addition of sodium salts or the accumulation of sodium salts about the feeding roots causes great damage and may prevent growth entirely.

Any home gardener who is troubled with alkali should first endeavor to reclaim the soil by installing good drainage and leaching out the excess salts;⁵ this method is successful with white alkali. Where black alkali is serious, as in parts of the California inland valleys, the first step is to provide good drainage; then fine sulfur at the rate of about 1,000 pounds per acre is added, and the soil leached thoroughly. Gypsum helps some, and for certain kinds of black alkali drainage and leaching alone may in time prove sufficient, though sulfur in some form is normally desirable in California before leaching. There will be certain alkali-tolerant plants that can be used while the alkali is still in some excess. *Gazania*, *Helianthus* (sunflower), *Lavatera* (tree mallow), *Mesembryanthemum* (ice plant), and *Portulaca* among the herbaceous plants, and such trees as *Acacias*, *Acer* (maple), *Albizzia*, *Camphora* (camphor), *Casuarina* (she-oak), *Eucalyptus rostrata*, *Koelreuteria*, *Leptospermum* (Australian tea), *Melaleuca* (honey-myrtle), *Platanus* (sycamore), *Quercus lobata* (valley oak), *Robinia pseudacacia* (yellow locust), *Ulmus* (elm), and *Washingtonia filifera* (Washington fan palm) are examples of plants which might be considered for their alkali resistance. Many other plants might be added after careful testing.

The Fertility of Garden Soils.—Plants require certain elements for growth and the support of life. From the air come oxygen and carbon (in the form of carbon dioxide) taken in through the breathing pores on the leaves and green stems. Even the roots require a certain amount of air in order to function. The plant gets its moisture from the soil and in this moisture are dissolved the compounds of various elements. Plant tissues contain large amounts of water, often over 90 per cent. From the solution about the soil particles in which the feeding roots find their way come many necessary food elements, chief of which are: nitrogen, potassium, phosphorus, magnesium, calcium, iron, and sulfur. Several other elements are needed in very small amounts. While nitrogen exists in the air it is not in a form that can be used by plants. Only the nitrate form can be assimilated directly. Small soil organisms have the ability to transform air and soil nitrogen into the form available for plant use. These organisms are involved in the process of decay which changes the nitrogen of organic matter to a form which the plants can assimilate.

⁵ Hibbard, P. L. Alkali soil. California Agr. Exp. Sta. Cir. 292:1-14. 1925.

The soil nutrients must be in a soluble form in order to be available for plant use. A plant cannot take up a needed element from an insoluble compound unless the other part of the compound can recombine. A nitrogenous fertilizer added to a garden soil will usually recombine in such a way with compounds already present as to render potassium nitrate available in the soil solution. In a similar way other elements form useful compounds in the soil solution. Any condition within the soil that prevents this desirable combination of elements will interfere with plant growth. The growth of a plant as a whole is in proportion to the element present in least adequate amount.

Organic matter in the soil is exceedingly valuable in rendering available elements already in the soil and also in giving the soil a good light texture so that cultivation is easy and the water can penetrate readily to the feeding roots. Aeration is much better in a loose soil. The organic matter also helps in the retention of soil moisture.

Only a very brief discussion of the special uses of the different soil nutrients is justified here.⁶ Nitrogen is very important in all protoplasm (the essential substance of all living cells) and in the development of new growth. It is the element most likely to be deficient in the soil. Next in order of importance are potassium and phosphorus. Potassium gives strength and aids healthy growth. Phosphorus is found in proteins along with sulfur. Phosphorus aids in root growth, in the development of blossoms, and in the maturity of seeds. Calcium is used in roots and indirectly has an important effect on the normal green color in leaves through certain reactions within the soil solution. Calcium (as in lime) favors beneficial bacterial growth within the soil and is important in healthy root growth. Iron and magnesium are important in the formation of the green chlorophyll in the leaves and stems. Chlorine, zinc, iodine, and still other elements are needed in small quantities for continued health. Soils with abnormal amounts of these various elements give poor growth or no growth at all. Plant life and growth depends on having the right amounts of *all the needed elements*. None can be omitted, even though only a small amount may be needed. The average fertile soil has such an abundance of most soil nutrients that a deficiency is unlikely with the exception of nitrogen, and occasionally potassium and phosphorus. Some soils may have excessive amounts of the alkali salts, as already mentioned, and some have too much lime for healthy growth. A great excess of nitrogen is

⁶ See also: Hoagland, D. R. Fertilizer problems and analysis of soils in California. California Agr. Exp. Sta. Cir. 317:1-16. 1930. References which may be found in public libraries go into more detail for those who may be interested.

about as bad as a deficiency; fertilizing therefore has to be carried on with good judgment. A great surplus of nitrogen favors excessive vegetative growth which may be unfruitful and weak.

The use of the soil nutrients depends on a good root system and a good top. Since carbohydrates (starches) are only formed in the green leaves in the presence of sunlight by a process known as photosynthesis, it is very important to have a large and healthy leaf surface exposed to plenty of sunlight. The presence of plant diseases and insects or any interference with the normal amount of sunlight will upset plant growth. The amount of light needed will depend on the particular plant. Plants may be classified according to the amount of sun or shade preferred, as well as the amount of moisture required. (See lists on page 35.) Plants that have an inadequate moisture supply cannot secure the right amount of soil nutrients even though these nutrients be present in the soil. Nitrogen is obtained from the soil by the roots, but other compounds of nitrogen known as proteins are largely formed in the young leaves or growing parts of the plant. From what has been said it will be seen that there is an interdependence between the soil, soil moisture, roots, stem, leaves, air, and sunlight. For the best growth all these different factors must be favorable. Trouble in any one will affect the growth of the whole plant.

Kinds of Fertilizers.—Any material which adds to the available plant food in the soil is called a fertilizer. There are several classes of fertilizers. The two large groups are the organic plant foods and the chemical or inorganic plant foods.

Organic plant foods come from an organic source. Some contain only nitrogen, others chiefly nitrogen and phosphorus, others nitrogen and potassium, and a fourth group all three of the important plant foods, nitrogen, phosphorus, and potassium.

The chemical plant foods are also divided into several classes: those containing nitrogen only, those containing phosphorus only, those containing potassium only, those containing nitrogen and phosphorus, one containing nitrogen and potassium, and a final group with phosphorus and potassium. These various chemical elements used by plants may be compounded to supply any composition desired. Table 1 shows the average range in composition of common plant foods.

The Use of Fertilizers.—The regular use of certain fertilizers in the home garden is one of the essentials of success. However, when planning a fertilizer program for flowers and ornamentals, it is important not to forget that irrigation, cultivation, pest control, rotation of crops, and other factors may have just as much to do with

success as the plant foods added. Furthermore, it does not pay to go to great expense for fertilizers unless these fertilizers really give very measurable results. Much of the fertilizer added may be a waste of money if the other factors are not favorable or if the soil is not really deficient in the elements added.

Barnyard manure is often the most popular fertilizer in home gardens because it supplies all three elements that are likely to be deficient. In addition, the organic matter is valuable for the physical condition of the soil. If only nitrogen is needed to favor the growth and better color, then one of the chemical fertilizers with a high nitrogen content might be the best investment. The actual cost of each pound of the desired plant food should be the basis for deciding which kind of fertilizer to buy for a given purpose. If the lawn needs a little nitrogen then the commercial fertilizers, such as ammonium sulfate with about 20 per cent nitrogen, may be the cheapest source of the needed nitrogen. On the other hand, if organic matter is needed to lighten the soil and also supply the elements likely to be deficient, barnyard manures, compost, or green manure plants, where they can be used should be considered. In unusual soils, potash and phosphorus may be deficient.

Soil Acidity and Alkalinity.—The vast majority of garden plants do well when the soil is about neutral, that is, neither very alkaline or acid. Little or no concern need be felt for most plants in the average loam soils. Soils that are too acid may be neutralized with lime, those that are too alkaline with commercial aluminum sulfate or sulfur. Some plants, like delphiniums and clematis, for example, may thrive best with a high percentage of lime in the soil, and it may be necessary to add lime. Some plants need an acid soil—for example, many of the conifers, the true lilies, rhododendrons, azaleas, meconopsis (Chinese blue poppy), members of the heather family, and most bog plants.

Soil Mulches.—In some cases an inert material like German peat or Delta peat may be added to lighten the soil and possibly give a slightly acid reaction. Such plants as azaleas and rhododendrons thrive best with such treatment. In an arid climate a mulch of peat or leaf mold is often helpful in maintaining surface moisture about the roots of such plants as herbaceous peonies, lilies, and pansies. Neither peat nor the mulches should be considered an important source of plant food, for they are generally very low in it.⁷ Any fertilizer needed should be added to the mulch or peat.

⁷ Burd, John S. Peat as a manure substitute. California Agr. Exp. Sta. Cir. 203:1-10. 1918. (Out of print).

TABLE 1
THE COMPOSITION OF FERTILIZERS*

Fertilizer	Nitrogen (N)† per cent	Phosphoric acid (P ₂ O ₅) per cent	Potash (K ₂ O) per cent	Total plant food per cent
Organic plant foods				
Nitrogen only, or chiefly nitrogen				
Dried blood.....	12.0-13.0	0	0	12.0-13.0
Garbage tankage.....	2.0-10.0	0	0	2.0-10.0
Peat or muck.....	0.8-4.0	0	0	0.8-4.0
Chiefly nitrogen and phosphorus				
Tankage.....	6.0-10.0	4.0-14.0	0	10.0-24.0
Bone meal (raw).....	3.0-4.0	18.0-20.0	0	21.0-24.0
Bone meal (steamed).....	3.0-3.5	21.0-25.0	0	24.0-28.5
Fish scrap.....	8.0-11.0	6.0-12.0	0	14.0-23.0
Peruvian guano.....	6.0-10.0	8.0-14.0	0	14.0-24.0
Chiefly nitrogen and potassium				
Tobacco stems.....	1.5-3.5	0	4.0-9.0	5.5-12.5
Nitrogen, phosphorus, and potassium				
Horse manure (rotted).....	0.8	0.6	1.4	2.8
Cow manure (in yard without litter).....	0.3	0.3	0.1	0.7
Sheep manure (dried).....	1.5-2.1	1.0-1.4	1.3-2.8	3.8-6.3
Hen manure (dried).....	1.0-2.0	0.4-2.2	0.5-1.1	1.9-5.3
Goat manure (dried).....	1.3-2.5	1.4-1.5	1.9-2.9	4.6-6.9
Leaves (composted).....	0.8	0.2-0.3	0.3-0.4	1.3-1.5
Rabbit manure.....	2.0	1.3	1.2	4.5
Chemical plant foods				
Nitrogen only				
Calcium nitrate.....	15.5	0	0	15.5
Ammonium nitrate.....	35.0	0	0	35.0
Nitrate of soda.....	15.6	0	0	15.6
Sulfate of ammonia.....	20.0-20.5	0	0	20.0-20.5
Cyanimid.....	20.5-24.7	0	0	20.5-24.7
Urea.....	46.6	0	0	46.6
Phosphorus only				
Superphosphate.....	0	19.0-20.0	0	19.0-20.0
Acid phosphate (Florida).....	0	14.0-17.0	0	14.0-17.0
Raw phosphate rock.....	0	32.0-37.0	0	32.0-37.0
Potassium only				
Kainit.....	0	0	12.0-13.0	12.0-13.0
Kelp ash.....	0	0	15.0-30.0	15.0-30.0
Muriate of potash (KCl).....	0	0	50.5	50.5
Sulfate of potash.....	0	0	48.0-50.0	48.0-50.0
Carbonate of potash.....	0	0	15.0-50.0	15.0-50.0
Nitrogen and phosphorus				
Bone black.....	0.8-1.6	32.0-35.0	0	32.8-36.6
Ammonium phosphate.....	10.5-16.5	20.0-47.0	0	30.5-63.5
Nitrogen and potassium				
Nitrate of potash.....	12.0-14.0	0	44.0-46.0	56.0-60.0
Phosphorus and potassium				
Wood ashes.....	0	1.5-2.0	3.0-7.0	4.5-9.0

* Data from various sources but mostly from Division of Plant Nutrition, College of Agriculture, University of California.

† Nitrogen is listed in percentage of nitrogen rather than ammonia, the phosphorus is listed in per cent phosphoric acid, and the potassium as potassium oxide. The total plant food percentage is secured by adding the nitrogen to the phosphoric acid and potassium oxide percentages. The reader will note that the total plant food does not represent the per cent of the three elements, however the above total is often used and does indicate the total fertilizer values to a limited extent.

Availability of Fertilizers and Plant Needs.—Most of the bulky organic manures only become available for plant use after rotting in the soil for several weeks when moisture, air, and temperature conditions within the soil are favorable. Such fertilizers should be added soon enough for the plant foods present to become available when the plant is in greatest need of them. For plants like the dahlia and the chrysanthemum the manures may be applied when the first buds appear, so that the nitrogen will be available when the blooms are out. But there are many of the chemical fertilizers and a few of the organic manures—sheep manure, chicken manure, and blood meal—that become available for plant use very shortly after adding. With these, top dressings may be given during the active growing season to force flowers such as the chrysanthemum, or to produce quick growth and good color in a short time, as on lawns and many of the greenhouse plants. Ornamentals on rather poor or infertile soil will often respond quickly if given these concentrated manures and fertilizers. A chrysanthemum is benefited by a dressing of fish meal, a bent grass lawn by one of ammonium sulfate, and ferns by some quickly available form of nitrogen. But these concentrated fertilizers must be used sparingly; for an excess is worse than no fertilizer at all. An excess of fertilizer or water tends to kill the roots and ends in decay, whereas drouth and a deficiency of plant food may only cause the plant roots to go dormant temporarily. The rotted roots will not come to life again but the dormant roots will when proper growing conditions are restored. Particular care is needed with potted plants, especially ferns and cyclamens.

A laboratory soil analysis does not reveal the availability of plant foods in any particular soil. Its chief service is in disclosing such unusual conditions as high alkalinity or marked deficiency of phosphorus and potassium. The plant itself is the index to the value of a fertilizer; field tests are now generally relied upon to show local fertilizer requirements. As a basis for trial, the following suggestions may be helpful: barnyard manure (well rotted) may be added at the rate of 2 pounds to the square foot of soil surface for plants like roses; or 1 or 2 forkfuls to plants like dahlias. Other organic fertilizers may be substituted when more economical. Potted plants that are being forced may be given liquid manure once a week or possibly a small amount each time the plants are watered, during the period between the appearance of buds and the time of full color. New growth always draws heavily on nitrogen and other important plant foods.

It will be seen that the condition of the plant, the amount of soil moisture present, and the time the nutrients in the fertilizer become available all affect the fertilizer program. As a rule no fertilizer should ever be added to the soil except when the soil is moist. Burning is very severe when a strong fertilizer comes in contact with the roots of a sensitive plant in dry soil. The time when the plant will be in need of certain fertilizers should be anticipated. Then the fertilizers may be added long enough ahead so that they will become available at the proper time. Barnyard manure and bone meal will require several weeks for complete decomposition. In no case should the fertilizer be applied to the planting hole next to the roots. A newly set plant cannot absorb much plant food until the roots have become established, and that will take several days even under favorable conditions. Young tender roots might be destroyed where manure was present at this stage of development. In very sandy soils fertilizing a plant like the dahlia with bone meal and even barnyard manure, placing the fertilizer several inches below the roots, may do no harm, but in a heavy clay loam such a practice would be very dangerous. Fertilizing should be done in such a way as not to upset the balance between top and root growth and the various elements taken in through these plant parts. Further experiments with ornamentals are being conducted to determine just when the greatest need for soil nutrients may come. Doubtless the need will vary with the kind of plant and the use to which it is put.

Preparing Liquid Manure.—Liquid manure is readily made by placing a sack of good barnyard manure in a barrel of water and then drawing off the manure extract as long as it has a dark color; more water may be added as the extract is withdrawn. Again, chemical fertilizers like sodium nitrate may be used, dissolving them in water at the rate of about 1 ounce to 3 gallons of water. Dried blood contains slightly less nitrogen and is more slowly available for plant use; therefore a little more may be added to the same volume of water. Blood meal is very soluble in water. Any of the commercial fertilizers which become 'fixed' when added in dilute form to the soil are not suitable for use as liquid manures.

IRRIGATION AND TILLAGE

Methods of Irrigation.—Since California gardens are so dependent on irrigation, it is well to consider very carefully an efficient and economical system. Galvanized pipes, either $\frac{3}{4}$ inch or $\frac{1}{2}$ inch, ac-

cording to the available water pressure, are in greatest use for conveying the water. The outlets should permit the connecting of a hose, or else heads should be attached for overhead sprinkling. In rural districts flooding of the home flower garden may be practiced, but even there a good pipe system is to be preferred.

Whether the watering will be done by hose or by overhead sprinkling will depend on the original capital available, the pressure of water present, and the kind of plants being grown. Small seedlings can be watered very satisfactorily with a sprinkling can. Lawns are most easily watered with an automatic sprinkling system. Border plants in the garden are usually sprinkled with a hose, though overhead sprinkling can be used for some kinds of plants. Many plants, like the dahlia and chrysanthemum, do not seem to be injured by overhead sprinkling at any time in ordinary weather. Small plants in closely planted borders can usually be watered best by a gentle mist spray with a hose or overhead sprinkling system. Plants very subject to mildew or plants troubled by rust, such as the hollyhock, ought not to have the foliage remain wet over night; therefore water should be applied early enough in the afternoon to permit drying off before night or else in the morning before the sun is hot enough to scald.

Plants like the snapdragon and hollyhock are best watered in basins so that the foliage is not wet. One of the big advantages of watering in basins is that the total amount of water used can be fairly accurately determined, and therefore the plant is not likely to be slighted. The watering of dahlias in basins is very practical, although hosing off the tops once a week helps in the control of pests. Top hosing of chrysanthemums is very beneficial in producing healthy, large leaves. Seedling plants in flats can be set in a shallow tub of water or gently sprinkled with a fine mist spray from a watering can. Subirrigation is not common in California. Tender flowers are usually injured by watering in the heat of the day.

Amount of Irrigation.—The water requirement of a plant is very largely dependent upon the leaf surface, the dryness of the air, and the extent of the feeding root system. Plants with a large leaf surface naturally lose more moisture by evaporation than plants with a small leaf surface. The same plant will lose more moisture by evaporation in dry, windy weather than in cool weather with a cloudy sky. A plant just set out cannot take up much water until the feeding roots become established, so part of the leaves are removed or the plant shaded carefully at first. Some kinds of plants seem to have a very spreading root system and are therefore able to take more moisture from a given soil than other plants which less completely cover the soil mass with

feeding roots. These plants are often called drouth resistant, although plants may be drouth resistant for other reasons, such as good moisture storage facilities within the plant parts. However, the soil type has little or nothing to do with the amount of water required or used by a plant. Modern irrigation specialists state that the water stays in a soil until it is used up by plants. Evaporation from the soil surface by capillarity is unimportant⁸ except where the water table is close to the surface; the top 2 or 3 inches of soil dries by evaporation. Attempts to conserve soil moisture about plants by means of cultivation is so much waste effort except as the cultivation kills weeds that are wasting moisture or the soil is loosened so that water can better reach the feeding roots. Cultivation is often overdone as far as the moisture requirements of plants are concerned.

Certain general rules may be used in estimating the amount of water required for some plants, but these rules are only partial guides. An acre of lawn uses from 4,250 to 5,600 gallons of water daily in San Francisco during the months of May to August, inclusive; in later months the water used falls off to 1,700 gallons or less.⁹ At Bakersfield, where the weather is much hotter, as many as 50 gallons per square foot or an average of 6,000 gallons per acre per day may be necessary.

Watering may be needed almost every day for shallow-rooted plants growing where the weather is rather dry. Plants like the dahlia may do best with watering twice a week even in a cool climate. The gardener should watch the plant carefully to see how it responds to weather and soil moisture conditions. The plant should not be permitted to wilt badly or permanently; any wilting that may occur during the day in hot weather should be reduced to a harmless minimum. Nothing can take the place of careful observation and practical experience in determining just when a particular plant should be watered. The soil should be wet down to the full depth of the feeding roots but should not be kept saturated. Instead the soil moisture may safely vary from the point of saturation (full holding capacity) to the point where the plant wilts (permanent wilting point). Of course more water should be applied before the wilting point is actually reached. This takes some experience. In time a gardener learns how plants respond in his particular home garden. A dry desert wind would require more frequent watering, especially if the plants were shallow-rooted. Very shallow-rooted plants may be protected against serious injury in dry weather by mulching the surface with leaf mold or

⁸ See "Transpiration losses," California Agr. Exp. Sta. Ann. Rep. 1921-22: 105. 1922.

⁹ Data from letter by J. B. Brown, Extension Specialist in Irrigation, on file in office of Irrigation Investigations, California Agricultural Experiment Station.

similar material so that more water is retained about the feeding roots in the top 3 or 4 inches of soil. The mulch does not save moisture lower down. Shading and regulation of ventilation are commonly practiced, as in lath-houses and greenhouses. Close planting will help in some cases. Plenty of organic matter in the soil helps to increase the water-holding capacity. A failure to wet the whole soil mass about the feeding roots will seriously affect the plant in times of moisture stress. In very hot weather or dry weather it may happen that the plant uses water faster than the roots can take it up. Temporary wilting then occurs, and if the deficiency is kept up very long the surface tissues may be injured and the plant sunburned; if the permanent wilting point is reached the plant may actually die. Certain plants are so constituted that they recover very slowly, if at all, after serious wilting. Many of the conifers, *Pimelea*, and young seedlings are examples. On the other hand the succulents are able to survive when badly abused. If there are to be serious moisture stresses, then plants known to be drouth-resistant should be selected (see page 36). The drouth-resistant trees do very well if they can be watered a little at the start. Many of the Australian shrubs are known to be drouth resistant—the *Leptospermums* and *Melaleucas*, for example.

Tillage and Cultivation.—Garden soils should be forked over or spaded occasionally to keep them loose and to incorporate organic matter and fertilizers. Compact soils are not well aerated and do not take moisture readily. The soil should be worked only enough to satisfy the needs of the particular plants being grown. Some plants in fairly loose soil may do well with little or no cultivation, as the daphne, the rhododendron and azalea, many of the berried shrubs, and a large majority of the wild flowers. Commercial crops often require cultivation when the same crops grown in the home garden can be watched and cared for in such a way that very little cultivation will suffice. Green manure crops rarely fit into the planting program of the home garden; turning under such crops is not as practical as in commercial plantings. The edges of the plantings in home gardens should be kept trim and enough cultivation given to maintain the healthy appearance of the foliage, but excessive cultivation is good neither in theory nor practice. In very shallow soils deep tillage may do more harm than good. If the soil is to be gradually improved then cultivation and tillage can be increased in depth from year to year so that in time the soil will be loose and fertile to a considerable depth. Certain kinds of plants like the sweet pea do well only when the soil is well prepared to a great depth, but it would be a mistake to attempt

such deep preparation if the soil were very shallow and would fail to give good growth later on.

Many California soils are heavy clay in nature and some are also adobe. Such soils are usually hard to manage. There is often a period of two or three days during which the soil can be easily cultivated without leaving clods. If tilled while too wet the soil particles are mashed together or become 'puddled'. If tilled while too dry, the soil remains rather lumpy. If there are many clods in the soil, they should be broken up after they have been left exposed to the air for a few days and sprinkled occasionally. In no case should the heavy soil be worked when it is very wet because it will not only be made harder to work later on but also it will take water very poorly. The addition of organic matter, and for some plants lime, will gradually improve the physical condition. Sand is practically worthless for loosening these heavy soils. Coal screenings are light and seem to help longer. Peat is also good as a soil lightener.

Sandy soils are naturally loose and may be improved by binding the soil particles together in some way. Barnyard manure, lime, and heavier soil may be used. Blow sands can be bound by using special sand grasses and windbreaks to check the wind velocity. After the sand movement has been stopped, many kinds of plants can be started, as in Golden Gate Park, San Francisco. All of this work takes time, but the persistent home gardener can really work wonders, especially when he has the cooperation of his neighbors in a well-worked-out district program. An attempt to drain land or check strong winds will seldom be justified except when all work together and share expenses for permanent improvement. Improvement cannot be permanent or economical when such troubles are widespread within a district and only a few attempt reclamation.

Tillage is not to be considered a very satisfactory method for killing out persistent weeds like morning-glory, though it may help. Where a gardener has small patches of persistent weeds it is best to dig out the roots piece by piece or else use one of the efficient weed eradicators now on the market. These weed killers usually contain sodium chlorate or one of the arsenicals. They are expensive and should only be used after other attempts for weed control have failed. Cultivation will be worth more in the end in keeping weeds from becoming established in the garden than all of the chemical weed killers combined. Prevention is cheaper than cure. But after dandelions, red oxalis, or morning-glory have once become established over a large part of a garden some rather drastic and perhaps expensive method of control may be required.

EQUIPMENT FOR HOME GARDENS

Equipment for raising flowers in the small home garden includes a hoe, rake, spading fork, shovel or spade, slender garden trowel for planting (preferably one with a wooden handle rather than cold metal), garden hose with good nozzle, hand pruning shears (Rieser pattern preferably), lopping shears for hedges, good pocket or budding knife, and wheelbarrow. Seed flats, seed pans, and pots will be needed for seedling ornamentals, and a sprinkling can with assorted nozzles to water small plants being propagated.

*Equipment for Propagating Plants*¹⁰.—About the minimum propagation equipment for the average home gardener is a glass-covered box filled with coarse sand (No. 4). With such a box most of the dormant cuttings can be rooted, provided the cuttings are properly ventilated and protected some from the hot sun. Seeds may be started in open pans or boxes and the seedlings later transferred to flats (shallow boxes) or the open ground. Propagation equipment ranges through cold frames and hotbeds to lath-houses, greenhouses, heated or unheated, and bottom-heated propagating boxes or benches within the greenhouse. Equipment may be selected according to the work to be done and the finances available. It is usually advisable to start with the simple and less expensive propagating equipment, increasing the facilities as finance, experience, and plants seem to justify.

The cold frame is just an enclosed area protected from the outside cold and heat by means of cheesecloth, waterproofed muslin, canvas, or glass. If heavy layers of a heating manure are installed beneath the soil in the frame then it is a hotbed. A lath-house is a house covered with lath in such a way as to admit some light and yet prevent any serious sun injury. Many people space the lath the width of one lath apart. This space may be a little wide for a very hot sun and possibly a little close for a district with little sun. Figure 2 shows a small lath shelter. The greenhouse or glasshouse¹¹ is covered partially or entirely with glass. The small lean-to glasshouse with roof and part of one side of glass is the simplest but also the least effective. Manufacturers of greenhouses will be glad to send literature and give cost estimates for various conditions. A lath-house and greenhouse can be advantageously used together for many kinds of ornamentals.

¹⁰ See also: Corbett, L. C. Propagation of plants. U. S. Dept. Agr. Farmers' Bul. 157:1-14. 1924.

Yerkes, G. E. The propagation of trees and shrubs. U. S. Dept. Agr. Farmers' Bul. 1567:1-51. 1929.

¹¹ Beattie, James H. Greenhouse construction and heating. U. S. Dept. Agr. Farmers' Bul. 1318:1-38. 1923.

Some herbaceous cuttings root best in a rather close frame (a propagating frame with the air kept humid by leaving very little ventilation) and a greenhouse lends itself very well to this kind of work. But those plants which thrive best with cool growing conditions, as calceolarias and chrysanthemums, or those plants which are to be held back some, need a cloth or partially open glass covering rather than a close greenhouse (that is, one with little ventilation). The growing part of the season may be spent under lath and the cold months in a greenhouse. Often a flowering plant, like the hothouse calceolaria, is rooted under glass, then is taken to a cold frame until



Fig. 2.—A lath shelter is almost a necessity in most home gardens, but an expensive lath-house is not essential. A pit covered with a durable lath shade is very satisfactory for young seedlings, rooted cuttings, and many potted plants.

about the time the buds appear, and again taken back to the greenhouse for flowering. Actual methods for propagating and growing the many kinds of ornamentals differ; the beginner should consult any of the well-known references on nursery management.¹²

Materials needed for propagation work include sharp, clean sand (No. 2 and No. 4), oak leaf mold, German peat, potting soil, and occasionally other materials such as rotted turf and gravel for cacti seedlings. Small paper planting pots, peat planting pots, fern dishes, and the like are needed for special purposes. The home gardener who

¹² Bailey, L. H. *The nursery manual*. 456 p. 226 figs. 9 pl. Macmillan Co., San Francisco. 1920.

Bailey, L. H., and Ethel Zoe Bailey. *Hortus*. 652 p. Macmillan Co., San Francisco. 1930.

Hottes, A. C. *Practical plant propagation*. A. T. De La Mare Co., Inc., New York. 1922.

Kains, M. G. *Plant propagation*. 322 p. Orange Judd Co., New York. 1921.

propagates orchids may need liter-size Ehrlenmeyer flasks in which the orchid seeds are planted on sterilized nutrient agar.¹³ Growers of subtropical plants may be interested in a solar propagating frame.¹⁴ Most hardware stores and seed stores or nurseries have a large assortment of equipment.

For a seed flat, almost any small box can be used, or the home gardener can construct a seed box like that used by nurserymen. A seed flat suitable for home use is 11 inches wide, 11 inches long, and 3¼ inches deep, outside measurement. Specifications for nursery or seed flats are shown below. See figure 3.

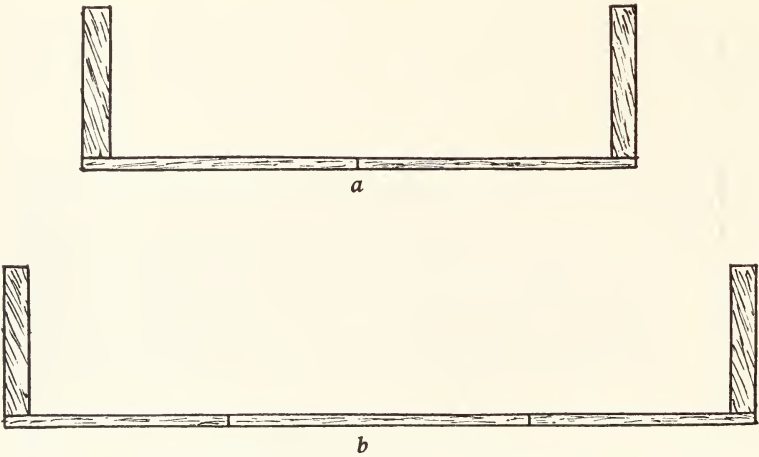


Fig. 3.—Seed flats, showing the methods of nailing bottoms on flats. A, Small seed flat. B, Standard flat. Cross-section view. Scale ¼ inch equals 1 inch.

	Part	Number of pieces	Width, inches	Length, inches	Thickness, inches
Standard nursery flat.....	Ends	2	3	10	1
	Sides	2	3	23	½
	Bottoms	2	4½	23	¼
		1	6	23	¼
Small seed flat.....	Ends	2	3	10	1
	Sides	2	3	11	½
	Bottoms	2	5½	11	¼

Seed pans are shallow pots used for growing plants from seeds. The deeper seed pans are sometimes called fern dishes and vary in both depth and diameter. A 6-inch pan (inside diameter) might be

¹³ For information on orchids see: White, E. A. American orchid culture. 228 p. 8 col. pl. A. T. De La Mare Co., Inc., New York. 1927.

¹⁴ Swingle, Walter T., T. R. Robinson, and E. May, Jr. Solar propagating frame for rooting citrus and other subtropical plants. U. S. Dept. Agr. Dept. Cir. 310:1-13. 1924.

4½ inches deep, an 8-inch pan 5½ inches deep, a 4½-inch pan 3 inches deep, and so on. A shallower pan is preferable for many kinds of seed. For example, a 10-inch pan with a depth of 2½ inches would meet all needs for the shallower-rooted seedlings and would take much less soil than the deeper pans.

SEASONAL ASPECTS OF THE FLOWER GARDEN

Some home gardeners confine themselves to a spring garden in which flowers like the tulip, narcissus, iris, and various rock plants predominate. Others specialize in dahlias or gladiolus, which are at their best in the summer months, or in chrysanthemums, which are at their best in October. If all the plants in a garden bloom during the same season, however, the garden is apt to be uninteresting during the rest of the year. For this reason there is a tendency, even among people who have a hobby, to diversify their plantings so that there will be bloom during a larger part of the year. In most locations in California it is possible to have some color in the garden every month in the year (see table 2).

In a year-round garden there will probably be a perennial border that has several distinct flushes of bloom, and possibly there will be a change in the prevailing color with each separate blooming period. Modern landscape designers often favor such planning of gardens. A green lawn or ground cover, a garden pool with its many water plants, green trees in the back ground, vines on the fences and trellises, ornamental gates, and garden furniture of good taste give a permanency to the garden which is generally lacking where a single kind of flower is grown.

The spring months in the garden bring to mind the spring bulbs, the flowering trees such as the peach, crab apple, and cherry, the primroses, and other early herbaceous plants. A little later will come the delphinium, gerbera (Transvaal daisy), pyrethrum, ixias, early gladiolus, rhododendrons and azaleas, perennial scabiosa (as *Scabiosa columbaria*), campanulas, and watsonias, followed by the main-season gladiolus, summer-blooming succulents, such as *Sempervivums* and *Echeverias*, godetias, clarkias, various poppies, and a host of other popular flowers in a wide range of color. Dahlias are at their best in July, August, and September, chrysanthemums in October, and the berried shrubs take care of the winter months with the help of a few flowers such as those of the little winter iris (*Iris unguicularis* or *I. stylosa*), fuchias, and other scattered late bloom.

TABLE 2
BLOOMING PERIODS OF COMMON GARDEN FLOWERS

Name	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<i>Abelia grandiflora</i>				←			→					
<i>Acacia baileyana</i>	←	→										
<i>Ageratum</i> (floss flower).....				←				→				
<i>Althea rosea</i> (hollyhock).....				←					→			
<i>Anemone</i>				←	→							
<i>Antirrhinum</i> (snapdragon).....	←											
<i>Aquilegia</i> (columbine).....				←								
<i>Arctotis</i> (African blue daisy).....				←				→				
<i>Azalea</i>	←			→								
<i>Begonia</i>		←							→			
<i>Bellis perennis</i> (English daisy).....	←							→				
<i>Buddleia davidi</i> (summer lilac).....					←				→			
<i>Calceolaria</i>					←							
<i>Calendula</i> (pot marigold).....	←											→
<i>Callistephus</i> (China aster).....					←							
<i>Camellia</i>						←		←				
<i>Campanula medium</i> (Canterbury bell).....					←	→						
<i>Canna</i>						←				→		
<i>Centaurea cyanus</i> (cornflower).....	←											
<i>Chaenomeles japonica</i> (Japanese quince).....	←											
<i>Cherianthus</i> (wallflower).....		←										
<i>Chorizema ilicifolium</i> (flame pea).....	←			←				→				
<i>Chrysanthemum coccineum</i> (pyrethrum).....				←					→			
<i>Chrysanthemum maximum</i> (Shasta daisy).....				←			→					
<i>Chrysanthemum morifolium</i> (chrysanthemum).....								←			→	
<i>Cineraria</i>				←								
<i>Clarkia</i>								→				
<i>Clematis</i> (virgin's bower).....					←			→				
<i>Coreopsis</i> (coreopsis and calliopsis).....											→	
<i>Cosmos</i>							←				→	
<i>Cytisus</i> (broom or genista).....			←									
<i>Dahlia</i>							←			→		
<i>Daphne odora</i>	←		→									
<i>Delphinium ajacis</i> (larkspur).....									→			
<i>Delphinium hybrids</i> (delphinium).....					←							
<i>Deutzia</i>					→							
<i>Dianthus caryophyllus</i> (bedding carnation).....		←										
<i>Dianthus plumarius</i> (spice pink).....			←		→							
<i>Dianthus barbatus</i> (sweet william).....				←								
<i>Dicentra</i> (bleeding heart).....				←	→							
<i>Diervilla</i> (weigelia).....				←	→							
<i>Digitalis</i> (foxglove).....						←		→				
<i>Dolichos lignosus</i> (Australian pea).....			←						→			
<i>Doronicum</i> (leopard's bane).....					←							
<i>Erica mediterranea</i> (Mediterranean heather).....			←			→						
<i>Erica melanthera</i>			→							←		→
<i>Erica persoluta</i>		←										
<i>Escallonia monteridensis</i>					←	→						
<i>Eschscholtzia</i> (California poppy).....				←								
<i>Eucalyptus ficifolia</i> (red-flowered gum).....	←	→										
<i>Euphorbia pulcherrima</i> (poinsettia).....												←
<i>Felicia</i> (blue marguerite).....	←											
<i>Freesia</i>	←			→								
<i>Fuchsia</i>				←							→	
<i>Gaillardia</i>					←						→	
<i>Gerbera</i> (Transvaal daisy).....	←											
<i>Geum</i>										→		
<i>Gladiolus</i>												
<i>Godetia</i>									→			
<i>Gypsophila</i> (baby's breath).....				←						→		
<i>Heliotropium</i> (heliotrope).....												
<i>Heuchera</i> (coral bells).....				←								
<i>Hibiscus rosa-sinensis</i> (hibiscus).....						←		→				
<i>Hyacinthus</i> (hyacinth).....	←											
<i>Hydrangea opuloides</i> (hydrangea).....												
<i>Hypericum</i> (gold flower).....				←								
<i>Iberis amara</i> (candytuft).....			←							→		
<i>Impatiens</i> (garden balsam).....	←											
<i>Ipomea</i> (morning-glory).....									→			
<i>Iris germanica</i> (German iris).....		←				→						
<i>Iris unguicularis</i> (winter iris).....										←		
<i>Iris xiphium hybrids</i> (Dutch iris).....			←	→								
<i>Jacaranda</i>							←					

A few flowers seem to fill in bare spots during each of the seasons except the winter. The little Virginian stocks (*Malcomia maritima*) can be planted repeatedly to give color to bare spots in the garden, such as about the irises after they are through bloom or about the daffodils and tulips when they are past their prime. These Virginian stocks take only six to eight weeks to begin blooming from seed sown broadcast and kept watered. Again, some of the bulbs like gladiolus may be planted at different times to extend the season of bloom. Sweet peas have a rather long season of bloom. With several of the cool flowering plants like the true lilies and perhaps sweet peas the season of bloom might be further extended if cold storage facilities were available to retard or advance the breaking of the normal rest period. These several examples are given to suggest possibilities within the modest home garden. Certainly, most California gardens can have color in practically every month of the year at no great expense.

FLOWERS AND ORNAMENTALS FOR SPECIAL USES

Beginners in home floriculture often have to be satisfied for the time being with annuals which give a quick effect. These annuals are usually inexpensive but involve considerable labor when planted on a large scale. Tall annuals for grouping in the background and climbing vines for growing about the buildings may be selected. In front of the tall annuals may be placed those perennial border plants which give a quick effect. The bedding annuals or low edging biennials and perennials are well adapted for planting near garden walks. A few shrubs which give a quick effect may be planted along with the annuals and herbaceous perennials.

Home gardeners should plan for permanent effects in the garden. Deciduous flowering shrubs and trees, deciduous flowering climbers and trailing plants, broad-leaved evergreens for flowers and berries, evergreen flowering trees, evergreen flowering vines and trailers, and occasionally some of the yuccas, grasses, and large succulents may be used to secure these permanent effects.

The flower grower usually finds that he must select plants for a particular environment. Possibly he may need herbaceous plants or shrubs for shade with plenty of moisture. In other parts of the garden there may be a need for plants which will tolerate a hot sun. These sun-loving plants may require considerable moisture in some instances but in many other cases the plants for sunny situations are drouth-

resistant. Only in a few cases will a drouth-resistant plant not be able to stand a hot sun.

Gardeners have a tendency to become specialists. After working to establish a permanent garden they often wish to build special kinds of gardens. Rock gardening has recently become very popular and has greatly increased the demand for rock garden plants of both



Fig. 4.—*Nigella* (love-in-a-mist) is an interesting hardy annual valued for its cut flowers and its ease of culture. (Photograph by courtesy of John Bodger and Sons Co.)

desert and alpine types. More people are building lily pools in their gardens than ever before, and this development has increased the need for aquatic and bog plants.

Those who do not have space for full-sized gardens may have gardens in hanging baskets, window boxes, and bowls or portable gardens. Many of the succulents (see list for desert-type rock gardens) are adapted to small portable gardens or miniature gardens. Some of the

plants suitable for hanging baskets and window boxes are given in one of the following lists.

Plants are frequently selected for their utility value in the home. Herbaceous and perennial plants may be chosen for their fragrance in the garden or in the home. Flowering plants are very frequently selected for their value in supplying cut flowers for the home as well as for the color they lend to the garden. In most cases the flowers planted must serve a combination of uses. The various uses just mentioned will be illustrated by the planting lists to follow.

FLOWERING PLANTS FOR QUICK EFFECT¹⁵

BEDDING ANNUALS

- | | |
|---|--|
| <i>Adonis aleppica</i> and <i>A. aestivalis</i> | <i>Gypsophila elegans</i> (baby's breath) |
| <i>Ageratum</i> (floss flower) | <i>Heliophila linearifolia</i> |
| <i>Alonsoa warsewiczii</i> | <i>Iberis amara</i> (candytuft) |
| <i>Antirrhinum</i> (snapdragon) | <i>Limonium suworowi</i> and other annual species (sea lavender) |
| <i>Browallia</i> | <i>Linum grandiflorum</i> (scarlet flax) |
| <i>Calendula</i> (pot marigold) (fig. 10) | <i>Lupinus pubescens</i> (lupin) |
| <i>Callistephus chinensis</i> (China aster) (fig. 9) | <i>Malcomia maritima</i> (Virginian stock) |
| <i>Celosia argentea</i> (woolflower and feathered cockscomb) | <i>Mathiola incana</i> var. <i>annua</i> (ten-weeks stock) (fig. 15) |
| <i>Centaurea cyanus</i> (cornflower) | <i>Nigella damascena</i> (love-in-a-mist) (fig. 4) |
| <i>Centaurea moschata</i> (sweet sultan) | <i>Papaver rheas</i> (shirley poppy) |
| <i>Chrysanthemum carinatum</i> (tricolor chrysanthemum) | <i>Petunia hybrida</i> (common garden petunia) (fig. 13) |
| <i>Chrysanthemum coccineum</i> (pyrethrum); perennial but often used as an annual | <i>Phlox drummondii</i> (annual phlox) (fig. 5) |
| <i>Clarkia</i> | <i>Reseda odorata</i> (mignonette) |
| <i>Cynoglossum</i> (Chinese forget-me-not) | <i>Schizanthus</i> ; species or hybrids (butterfly flower) |
| <i>Dianthus chinensis</i> var. <i>heddewigi</i> (Chinese pink) and <i>D. hybrid</i> (sweet wivelsfield) | <i>Tagetes</i> (African and French marigold) |
| <i>Eschscholtzia</i> (California poppy) (fig. 11) | <i>Tropeolum majus</i> (nasturtium) |
| <i>Gaillardia pulchella</i> var. <i>pieta</i> (annual blanket flower or gaillardia) | <i>Ursinia anthemoides</i> |
| <i>Godetia</i> | <i>Venidium decurrens</i> and other species |
| | <i>Viola tricolor</i> var. <i>hortensis</i> (pansy) |

TALL ANNUALS FOR GROUPING

- | | |
|--|--|
| <i>Amaranthus</i> | <i>Cosmos bipinnatus</i> (fig. 6) |
| <i>Arctotis stechadifolia</i> (African blue-daisy) | <i>Delphinium ajacis</i> (annual larkspur) (fig. 12) |
| <i>Cleome spinosa</i> (giant spider plant) | <i>Rudbeckia bicolor</i> (coneflower) |
| <i>Coreopsis tinctoria</i> (calliopsis) | <i>Salpiglossis</i> (painted glories) |

¹⁵ For full descriptions see seed and nursery catalogs or: Bailey, L. H. Standard cyclopedia of America horticulture. 3 vols. 3639 p. Macmillan Co., San Francisco. 1928. Also: Bailey, L. H. Manual of cultivated plants. 851 p. Macmillan Co., San Francisco. 1924.

LOW EDGING ANNUALS

Ageratum (dwarf floss flower)
Bellis perennis (English daisy)
Celosia argentea (dwarf celosia)
Dianthus (Chinese pink)
Iberis amara (dwarf candytuft)
Lobelia erinus
Lobularia maritima (sweet alyssum)
Malcomia maritima (Virginian stock)

Myosotis (forget-me-not)
Portulaca
Reseda odorata (mignonette)
Torenia fournieri; usually annual
Verbena hybrida (common garden
 verbena)
Viola tricolor var. *hortensis* (pansy)



Fig. 5.—*Phlox drummondii*, with its many colors, makes a fine annual for massing and borders. It will bloom practically the whole season if planted in the full sun and properly watered. (Photograph by courtesy of Germain Seed and Plant Co.)

ANNUAL CLIMBING VINES

Calonyction (moonflower); perennial
 used as an annual
Cardiospermum halicacabum (balloon
 vine)
Dolichos lablab (hyacinth bean)
Humulus (Japanese hopvine)
Ipomea purpurea (morning-glory)
Lagenaria and other gourd genera
 (ornamental gourds)
Lathyrus odorata (sweet pea) (fig. 16)

Phaseolus coccineus (scarlet runner
 bean)
Quamoclit lobata; perennial used as
 an annual
Quamoclit pennata (cypress vine)
Quamoclit sloteri (cardinal climber)
Tropeolum majus (nasturtium)
Tropeolum peregrinum (canary bird
 vine)



Fig. 6.—The crested cosmos, a recent introduction to this group of beautiful summer and autumn annuals, has added an artistic touch as shown in the photograph. (Photograph by courtesy of John Bodger and Sons Co.)

LOW EDGING BIENNIALS AND PERENNIALS

- | | |
|--|---|
| <i>Alyssum saxatile</i> (golden tuft) | <i>Freesia</i> |
| <i>Anemone japonica</i> (Japanese anemone) | <i>Gazania</i> |
| <i>Bellis perennis</i> (English daisy) | <i>Helianthemum</i> (sun rose) |
| <i>Campanula</i> , especially <i>C. carpatica</i> and <i>C. portenschlagiana</i> | <i>Lychnis coronaria</i> (mullein pink) |
| <i>Centaurea</i> (sweet sultan) | <i>Oxalis</i> |
| <i>Chrysanthemum maximum</i> (Shasta daisy) | <i>Papaver nudicaule</i> (Iceland poppy) |
| <i>Chrysanthemum parthenium</i> var. <i>aureum</i> (golden feather); for foliage border. | <i>Physalis alkekengi</i> (Chinese lantern-plant) |
| <i>Dianthus plumarius</i> (border or spice pinks) (fig. 19) | <i>Primula malacoides</i> , <i>P. polyantha</i> , <i>P. elatior</i> , and <i>P. veris</i> (primroses) |
| | <i>Saponaria ocymoides</i> (soapwort) |
| | <i>Sedum</i> and other succulents |
| | <i>Thymus</i> , especially <i>T. serpyllum</i> (woolly thyme) |

PERENNIAL BORDERS (including some shrubs)

- | | |
|--|---|
| <i>Anthemis nobilis</i> (chamomile) | <i>Iris</i> ; all species (fig. 23) |
| <i>Anthemis tinctoria</i> (golden marguerite) | <i>Kniphofia uvaria</i> (tritoma or poker-plant) |
| <i>Antirrhinum</i> (snapdragon) | <i>Lavandula</i> (lavender) |
| <i>Aquilegia</i> (columbine) | <i>Leonotis</i> (lion's tail) |
| <i>Althea rosea</i> (hollyhock) | <i>Lupinus</i> , especially <i>L. hybridus</i> varieties (lupin) |
| <i>Calceolaria hybrids</i> ; shrubby species | <i>Narcissus tazetta</i> and other species |
| <i>Campanula medium</i> (Canterbury bell) | <i>Paeonia suffruticosa</i> (tree peony) (fig. 28) |
| <i>Canna</i> | <i>Papaver nudicaule</i> (Iceland poppy) |
| <i>Cephalaria alpina</i> | <i>Papaver orientalis</i> (Oriental poppy) |
| <i>Cheiranthus</i> (wallflower) | <i>Pelargonium</i> (geranium) |
| <i>Chrysanthemum frutescens</i> (marguerite) | <i>Pentstemon</i> |
| <i>Cuphea platycentra</i> (cigar flower) | <i>Phlomis fruticosa</i> (Jerusalem sage) |
| <i>Cytisus racemosus</i> (broom or genista) | <i>Physostegia virginiana</i> (false dragon-head) |
| <i>Dahlia</i> (fig. 20) | <i>Rehmannia angulata</i> |
| <i>Delphinium</i> (perennial larkspur) | <i>Rosa</i> (rose) (fig. 26) |
| <i>Digitalis</i> (foxglove) | <i>Rudbeckia laciniata</i> var. <i>hortensia</i> (golden glow) |
| <i>Doronicum exelsum</i> (leopard's bane) | <i>Salvia</i> especially <i>S. splendens</i> , <i>S. farinacea</i> , and <i>S. leucantha</i> (flowering sage) |
| <i>Eryngium amethystinum</i> | <i>Scabiosa columbaria</i> and <i>S. caucasica</i> (blue bonnet) (perennial scabiosa) |
| <i>Fuchsia</i> | <i>Trollius</i> (globe flower) |
| <i>Gaillardia aristata</i> | <i>Tulipa</i> (tulip) |
| <i>Gerbera jamesoni</i> (Transvaal daisy) | <i>Verbascum phoeniceum</i> and other species (mullein) |
| <i>Geum chilense</i> (geum) | <i>Veronica hulkeana</i> and similar species |
| <i>Gladiolus</i> (sword lily) (fig. 22) | |
| <i>Helopsis helianthoides</i> (orange sunflower) | |
| <i>Heuchera sanguinea</i> (coral bells) | |
| <i>Hibiscus rosa-sinensis</i> (Chinese hibiscus and <i>H. moscheutos</i> (rose mallow) | |

ORNAMENTAL GRASSES FOR THE BORDER

- | | |
|--|---|
| <i>Arrhenatherum elatius</i> var. <i>tuberosum</i> (striped oat grass) | <i>Phalaris arundinacea</i> var. <i>picta</i> (variegated ribbon grass) |
| <i>Pennisetum ruppelii</i> (fountain grass) | <i>Stipa pennata</i> (feather grass) |

PERENNIALS FOR MORE PERMANENT EFFECTS

DECIDUOUS FLOWERING SHRUBS

Azalea mollis (azalea)
Berberis (barberry) especially *B. wilsonae*; semideciduous
Bouvardia triphylla (bouvardia)
Buddleia variabilis (summer lilac)
Cesalpinia gilliesi (bird-of-paradise shrub)
Calycanthus occidentalis (sweet-scented shrub)
Caragana (pea tree)
Caryopteris incana (blue spirea)
Chaenomeles japonica (Japanese quince)
Cornus (dogwood)
Daphne mezereum (daphne)
Deutzia gracilis, *D. scabra*, and hybrids (deutzia)
Diervilla floribunda and hybrids (weigelia)
Forsythia suspensa (golden bells)
Hibiscus syriacus (rose of Sharon)
Hydrangea opuloides; semideciduous outside
Kolkwitzia amabilis (beauty bush)

Lagerstremia indica (crape myrtle)
Magnolia, especially *M. stellata*
Peonia suffructicosa (tree peony)
Philadelphus (mock orange, syringa)
Prunus cerasifera var. *pissardi* (purple-leaved flowering plum) *P. persica* (flowering peach) *P. triloba* (flowering almond), *P. serrulata* (Japanese flowering cherry), and *P. glandulosa* (dwarf flowering almond)
Punica granatum (pomegranate)
Pyrus, especially *P. pulcherrima* (showy crab)
Rhus (sumach)
Ribes sanguineum (flowering currant)
Spiraea prunifolia (bridal wreath) and *S. vanhouttei*
Symphoricarpos albus (snowberry) and *S. orbicularis* (Indian currant)
Syringa vulgaris (lilac)
Tamarix parviflora (tamarisk)
Viburnum opulus var. *sterile* (snowball), *V. carlesii*, and *V. fragrans*

DECIDUOUS FLOWERING TREES

Albizia julibrissin (silk tree)
Catalpa
Cercis (Judas tree or red bud)
Crataegus (thorn tree; hawthorn)
Laburnum (golden chain tree)
Liriodendron (tulip tree)
Magnolia soulangeana
Melia (Texas umbrella tree)
Populus tremula var. *pendula* (weeping poplar); valued for its catkins
Prunus cerasifera var. *pissardi* (purple-leaved flowering plum), *P. persica*

(flowering peach), *P. triloba* (flowering almond), and *P. serrulata* (Japanese flowering cherry)
Pyrus spectabilis (Chinese flowering apple), *P. ionensis* (Bechtel's flowering crab), and *P. theifera* (tea crab)
Robinia hispida (rose acacia)
Salix discolor (pussy willow)
Sophora japonica (Japanese pagoda tree)
Sorbus americana (mountain ash)

DECIDUOUS FLOWERING CLIMBERS OR TRAILING PLANTS

Actinidia chinensis (yangtao)
Antigonon leptopus (coral vine, or rosa de montana)
Araujia sericifera (*Physianthus albens*) (cruel plant)
Campsis chinensis (Chinese trumpet creeper) *C. radicans* (trumpet creeper)
Clematis, especially *C. montana* and *C. paniculata* (virgin's bower)
Humilis (Japanese hop vine)

Lathyrus latifolius (perennial sweet pea)
Lonicera japonica (Japanese honeysuckle)
Mandevilla suaveolens (Chilean jasmine)
Polygonum auberti (silver lace vine)
Pueraria (kudzu vine)
Rosa; all climbing roses
Wistaria sinensis (Chinese wistaria) and *W. floribunda* (Japanese wistaria)

BROAD-LEAVED EVERGREEN SHRUBS FOR FLOWERS OR BERRIES

- Abelia grandiflora*
Abutilon (flowering maple)
Acacia, especially *A. baileyana* and *A. pravissima*
Arbutus unedo (strawberry tree)
Azalea, especially *A. indicum* and *A. obtusum*
Bauhinia (orchid tree)
Berberis darwini (Darwin's barberry)
Boronia, especially *B. elatior* and *B. megastigma*
Buddleia (summer lilac)
Callistemon (bottle brush)
Camellia japonica (fig. 29)
Cantua buxifolia (magic plant)
Carissa grandiflora (natal plum)
Carpenteria californica
Cassia tomentosa (senna)
Ceanothus (wild lilac)
Cestrum
Choisya ternata (Mexican orange)
Chorizema ilicifolium (holly pea or flame pea)
Cistus (rock rose)
Cotoneaster; for berries
Coronilla
Cornus capitata (Himalayan dog-wood)
Cytisus racemosus (genista or broom) and *C. andreaeanus* hybrids
Daboccea cantabrica (*Erica menziesii*) (Irish bell heather)
Daphne, especially *D. odora* and *D. cneorum*
Diosma (breath of heaven)
Dombeya wallichii
Duranta repens (golden dewdrop)
Echium fatuosum
Eleagnus (oleaster)
Erica (heather)
Erythrina (coral tree)
Escallonia
Eugenia (brush cherry)
Euonymus
Euphorbia pulcherrima (poinsettia)
Fabiana imbricata
Fuchsia
Gardenia jasminoides (Cape jasmine or gardenia)
Grevillea, especially *G. thelemanniana* and *G. banksii*
Hibiscus rosa-sinensis (Chinese hibiscus)
Hypericum moserianum (gold flower)
Ilex (holly); for berries
Lochroma
Kalmia latifolia (mountain laurel)
Kerria japonica (Japanese yellow rose)
Lantana camara (lantana)
Lavandula (lavender)
Leonotis (lion's tail)
Leptospermum (Australian tea tree)
Leucophyllum texanum
Leucothoe (*Andromeda*) *catesbaei*
Ligustrum (privet)
Lippia citriodora (lemon verbena)
Lonicera nitida (bush honeysuckle)
Mahonia, especially *M. japonica* (Japanese *Mahonia*) and *M. aquifolium* (Oregon grape)
Malvaviscus arboreus
Melaleuca (honey-myrtle or paper-bark)
Michelia fuscata (banana shrub)
Nandina domestica (Japanese nandina)
Nerium (oleander)
Parkinsonia aculeata (Jerusalem thorn)
Pieris (*Andromeda*) especially *P. japonica* and *P. floribunda*
Pernettya mucronata; for berries
Photinia arbutifolia (toyon)
Pimelea ferruginea (rice flower)
Pittosporum, especially *P. tobira* and *P. undulatum*
Plumbago capensis
Polygala dalmaisiana
Prunus, especially *P. laurocerasus* (cherry-laurel) and *P. lusitanica* (Portugal laurel)
Punica granatum var. *nana* (dwarf pomegranate)
Pyracantha (evergreen hawthorn or firethorn); for berries
Raphiolepis umbellata and *R. indica*
Rhododendron, especially *R. ponticum*, *R. catawbiense*, and hybrids
Rondeletia cordata
Salvia (flowering sage)
Skimmia japonica and *S. fortunei*
Spartium junceum (Spanish broom)
Streptosolen jamesoni
Strobilanthes isophyllus (bedding conehead)
Tecoma stans (yellow bignonia)
Teucrium fruticans
Tibouchina (*Pleroma*)
Veronica hulkeana and other species
Viburnum tinus (laurestinus)
Wigandia caracasana

EVERGREEN FLOWERING TREES

Acacia, especially *A. decurrens* var. *mollis* (black wattle), *A. decurrens* var. *dealbata* (silver wattle), and *A. floribunda* (white sallow acacia)
Arbutus menziesi (madrone)
Brachychiton acerifolium (flame tree)
Citrus aurantium (orange)
Duranta repens (golden dewdrop)
Eucalyptus, especially *E. ficifolia* (red-flowered gum) and *E. leucoxylon rosea* (pink-flowered white iron-bark)
Grevillea robusta (silk oak)

Harpullia arborea
Jacaranda ovalifolia (jacaranda)
Lagunaria patersoni
Leptospermum (Australian tea tree)
Lyonothamnus (island ironwood)
Magnolia grandiflora
Photinia serrulata
Pittosporum, especially *P. undulatum* (sweet pittosporum)
Schinus molle (pepper tree); for berries
Tamarix articulata (athel); mostly for windbreak

EVERGREEN FLOWERING VINES AND TRAILING PLANTS

Akebia quinata
Bignonia capreolata (trumpet flower or cross vine)
Buginvillea spectabilis, especially variety *Crimson Lake*
Calonyction (moonflower)
Cardiospermum hirsutum (balloon vine)
Clytostoma callistegioides (*Bignonia speciosa*, *B. violacea*)
Dolichos lignosus (Australian pea vine)
Doxantha unguis-cati (*Bignonia unguis-cati*, *B. tweediana*) (catsclaw)
Gelsemium sempervirens (Carolina yellow jessamine)
Hardenbergia (coral pea)
Hibbertia volubilis (guinea flower)
Hoya carnosa (wax plant); tender
Jasminum (jasmine)
Lantana sellowiana (trailing lantana)
Lonicera hildebrandiana (*L. hildebrandii*); also *L. japonica* (Japanese honeysuckle); semideciduous
Mandevilla suaveolens (Chilean jasmine)
Milletia megasperma (*Wistaria megasperma*) (evergreen wistaria)

Pandorea australis (*Tecoma australis*) (wonga-wonga vine)
Pandorea ricasoliana (*Tecoma mackenzii*)
Passiflora (passion flower)
Phacdranthus buccinatorius (*Bignonia chereve*) (red trumpet vine)
Phaseolus caracalla (corkscrew flower or snail vine)
Philadelphus karwinskianus (*P. mexicanus*) (climbing syringa)
Plumbago capensis
Pyrostegia ignea (*Bignonia venusta*) (flaming trumpet)
Ruellia makoyana
Russelia juncea
Solandra guttata (cup of gold)
Solanum jasminoides (potato vine)
Sollya heterophylla (Australian bluebell creeper)
Swainsona galegifolia (Swainson pea)
Tacsonia manicata (scarlet passion flower)
Tecomaria capensis (Cape honeysuckle)
Trachelospermum jasminoides (star jasmine)
Vinca major (myrtle vine)

GRASSES, YUCCAS, AND SIMILAR PLANTS VALUED FOR BLOOMS

Aloe arborescens and similar species
Billbergia nutans
Cortaderia argentea (pampas grass)
Cyperus (umbrella plant)
Musa (banana)

Phormium tenax (New Zealand flax)
Strelitzia reginae (bird-of-paradise flower, or crane flower)
Yucca filamentosa (Adam's needle)

PLANTS FOR SPECIAL ENVIRONMENTS

HERBACEOUS PLANTS FOR SHADE WITH PLENTY OF MOISTURE

- Alstroemeria aurantiaca* (Peruvian lily)
Anemone japonica (Japanese anemone)
Aquilegia, especially *A. cerulea* (Rocky Mountain columbine), *A. chrysantha*, and hybrids: for light shade
Asarum (wild ginger)
Astilbe, especially *A. astilboides* and *A. davidi* (herbaceous spirea)
Begonia, especially *B. semperflorens* (includes Vernon and other kinds)
Calceolaria integrifolia and hybrids: light shade
Campanula medium (Canterbury bells); light shade
Cineraria cruentus (florists' cineraria)
Convallaria (lily-of-the-valley)
Cyclamen indicum (florists' cyclamen)
Erythronium (dog-tooth violet)
Dicentra (bleeding heart)
Digitalis (foxglove)
Geum chilense (geum)
- Hedychium coronarium* (garland flower)
Helleborus niger (Christmas rose)
Heuchera sanguinea (coral bells)
Iris, especially *I. unguicularis*, *I. fulva*, *I. japonica*, and *I. longipetala*
Lobularia maritima (sweet alyssum)
Mimulus moschatus (musk flower)
Myosotis (forget-me-not)
Pentstemon; especially *P. gloxiniodes* and *P. heterophyllus*
Primula malacoides (fairy primrose), *P. polyantha* (polyanthus primrose), *P. elatior* (oxslip), *P. veris* (cowslip), *P. japonica*, and other species of primroses
Salvia (flowering sage)
Saxifraga (saxifrage)
Silene (Indian pink); for light shade
Thalictrum (meadow rue)
Viola; especially *V. odorata* (violet), *V. tricolor* var. *hortensis* (pansy), and *V. cornuta* (tufted pansy or viola); for light shade

SHRUBS FOR SHADE WITH PLENTY OF MOISTURE

- Cotoneaster*; for light shade
Escallonia; for light shade
Fuchsia
- Hydrangea opuloides* (hydrangea)
Rhododendron and *Azalea*

FLOWERING PLANTS FOR SUN WITH PLENTY OF MOISTURE

- Aquilegia* (columbine)
Asarum (wild ginger)
Bellium minus
Brodiaea coronaria (harvest brodiaea), *B. capitata* (blue dicks), and other species
Campanula; most dwarf species
Calochortus (Mariposa lily)
Convolvulus mauritanicus (dwarf morning-glory)
Erigeron, especially *E. alpinus* and *E. mucronatus*
Geum chilense, especially the varieties Mrs. Bradshaw and Lady Stratheden
- Iris sibirica* (Siberian iris) and *I. levigata* (Japanese iris)
Kniphofia uvaria (tritoma or poker plant)
Oenothera (evening primrose)
Phlox subulata and other low-growing species
Primula polyantha, *P. elatior*, and *P. veris* (primrose)
Viola odorata (violet), *V. cornuta* (tufted pansy), and *V. tricolor* var. *hortensis* (pansy)
Zauschneria californica (California fuchsia)

FLOWERING PLANTS FOR SUNNY, HOT SITUATIONS AND WITH A
MODERATE MOISTURE SUPPLY

- Abronia* (sand verbenas)
Achillea
Aethionema
Aloe
Arabis alpina (rock cress)
Aubretia deltoidea
Brodiaea, especially *B. capitata* (wild hyacinth), *B. coccinea* (firecracker flower), and *B. coronaria* (harvest brodiaea)
Calochortus (Mariposa lily)
Centaurea cyanus (corn flower)
Chrysanthemum maximum (Shasta daisy)
Coreopsis lanceolata and *C. grandiflora* (coreopsis)
Convolvulus mauretanicus (dwarf morning-glory)
Delphinium nudicaule and all western species (wild larkspurs)
Dicentra spectabilis (bleeding heart)
Dolichos lignosus (Australian pea)
Echinops ritro (globe thistle)
Echiveria gibbiflora and similar species
Erysimum (wild wallflower)
Eschscholtzia (California poppy)
Felicia amelloides (blue marguerite)
Gaillardia aristata
Gaura lindheimeri
Gypsophila repens
- Helenium autumnale* (sneezeweed)
Helianthemum chamaecistus (sun rose)
Helianthus (sunflower)
Heuchera sanguinea (coral bells)
Hemerocallis (day lily)
Iris germanica (German iris)
Leucocoryne izioides
Linum perenne (perennial blue flax)
Mimulus guttatus (monkey-flower)
Papaver rheas (shirley poppy)
Pelargonium peltatum (ivy geranium) and *P. domesticum* (fancy geranium)
Pentstemon gloxinoides and western species, especially *P. heterophyllus*
Petunia hybrida (common garden petunia)
Potentilla (cinquifol)
Rudbeckia (coneflower)
Scabiosa atropurpurea (mourning bride or pineushion flower)
Silene (catchfly, Indian pink, etc.)
Stokesia levis (Stoke's aster)
Tagetes patula (French marigold) and *T. erecta* (African marigold)
Verbena hybrida (common garden verbenas)
 Wild-flower mixtures of hardy varieties, which may be secured from any seedsman

DROUTH-RESISTANT FLOWERING PLANTS

- Acacia*, especially *A. armata* (kangaroo thorn), *A. pravissima* (Oven's acacia) and *A. baileyana*
Buddleia variabilis (summer lilac)
Callistemon (bottle brush)
Cassia tomentosa
Cistus albidus (white rock rose)
Eucalyptus ficifolia (red-flowered gum), *E. leucoxydon rosea* (white ironbark), *E. sideroxydon rosea* (red ironbark)
- Melaleuca* (honey-myrtle or paper-bark)
Nerium (oleander)
Parkinsonia (Jerusalem thorn)
Pittosporum tobira, and *P. undulatum* (sweet pittosporum)
Romneya coulteri (Matilija poppy)
Spartium junceum (Spanish broom)
Stokesia levis (Stoke's aster)

See also: Rock garden plants, desert type (p. 37) and "Grasses, yuccas, and similar plants valued for bloom" (p. 34).

PLANTS FOR SPECIAL GARDENS¹⁶

ROCK GARDEN PLANTS, DESERT TYPE

- | | |
|---|---|
| <i>Achillea ptarmica</i> (sneezewort) | <i>Opuntia ficus-indica</i> , and other species of cacti used in rock gardens |
| <i>Aethionema grandiflorum</i> | <i>Saponaria ocymoides</i> (soapwort) |
| <i>Alyssum saxatile</i> (golden tuft) | <i>Sedum</i> , especially such species as <i>S. album</i> and <i>S. spurium</i> |
| <i>Arabis alpina</i> (rock cress) | <i>Sempervivum</i> , especially <i>S. tectorum</i> and similar species |
| <i>Aubretia deltoidea</i> | <i>Thymus serpyllum</i> , especially the variety known as woolly thyme (creeping thyme) |
| <i>Cerastium tomentosum</i> ; should be confined | <i>Zauschneria californica</i> (California fuchsia) |
| <i>Convolvulus mauritanicus</i> (dwarf morning-glory) | |
| <i>Eriophyllum lanata</i> | |
| <i>Euphorbia myrsinites</i> | |
| <i>Iberis gibraltarica</i> (perennial candy-tuft) | |

ROCK GARDEN PLANTS, ALPINE TYPE

- | | |
|--|--|
| <i>Anchusa myosotidiflora</i> | <i>Lewisia</i> |
| <i>Aquilegia</i> , especially <i>A. pyrenica</i> and similar hardy species (columbine) | <i>Mertensia virginica</i> (Virginia cow-slip) |
| <i>Asarum</i> (wild ginger) | <i>Meconopsis baileyi</i> (blue Chinese poppy) |
| <i>Aster alpinus</i> | <i>Myosotis</i> (forget-me-not) |
| <i>Bellium minus</i> | <i>Oxalis</i> |
| <i>Calochortus</i> (Mariposa lily) | <i>Phlox</i> , hardy species |
| <i>Campanula</i> , especially perennial species | <i>Primula auricula</i> and other hardy species |
| <i>Dianthus plumarius</i> , <i>D. caesius</i> , <i>D. deltoideus</i> (perennial pinks) | <i>Saxifraga</i> (saxifrage) |
| <i>Dodecatheon</i> (shooting star) | <i>Sedum</i> , especially <i>S. roseum</i> and similar hardy species |
| <i>Doronicum clusii</i> (leopard's bane) | <i>Sempervivum</i> (house leek) |
| <i>Erinus alpinus</i> | <i>Silene</i> |
| <i>Erigeron</i> ; hardy species | <i>Thymus serpyllum</i> (creeping thyme) |
| <i>Erythronium</i> (dogtooth violet) | <i>Viola</i> , especially the hardy and shade-loving species like <i>V. pedata</i> (birds-foot violet) |
| <i>Gentiana</i> (gentians) | |
| <i>Heuchera sanguinea</i> (coral bells) | |
| <i>Hypericum repens</i> (creeping gold flower) | |

FLOWERING AQUATIC PLANTS

- | | |
|--|---|
| <i>Aponogeton distachyus grandiflorum</i> (water hawthorn) | <i>Nelumbo nucifera</i> (Egyptian lotus) |
| <i>Eichornia crassipes</i> (water hyacinth) | <i>Nymphaea</i> (hardy and tropical water lilies) |
| <i>Hydrocleis nymphoides</i> (water poppy) | <i>Nymphoides peltatum</i> (floating heart) |

¹⁶For further information on rock garden plants see various reference books as:

Correvo, Henry. Rock garden and alpine plants. 560 p. Macmillan Co., San Francisco. 1930.

Hoffman, Ralph, E. O. Orpet, Eric Walther, and James West. Cacti and other succulents. 107 p. Garden Tours Committee of the Community Arts Association, Santa Barbara. 1930.

Houghton, Arthur D. The cactus book. 145 p. Macmillan Co., San Francisco. 1930.

Rockwell, F. F. Rock gardens. 86 p. Macmillan Co., San Francisco. 1928.

FLOWERING BOG PLANTS (some will grow in water)

<i>Cyperus</i> (umbrella plant)	<i>Lobelia cardinalis</i>
<i>Hymenocallis caribae</i> (spider lily)	<i>Mimulus moschata</i> (musk flower)
<i>Iris</i> , especially <i>I. pseudacorus</i> , <i>I. levis</i> (Japanese iris) and <i>I. siberica</i> (Siberian iris)	<i>Thalia dealbata</i> (water canna)
	<i>Typhae</i> (cat-tail)
	<i>Zantedeschia</i> (calla)

FLOWERING PLANTS FOR HANGING BASKETS OR WINDOW BOXES

<i>Begonia</i> (trailing varieties)	<i>Pelargonium peltatum</i> (ivy geranium)
<i>Campanula</i> , especially <i>C. isophylla</i> and <i>C. garganica</i>	<i>Petunia</i> , especially balcony varieties
<i>Lobelia</i> (trailing varieties)	<i>Sedum sieboldii</i>
<i>Lotus berthelotii</i>	<i>Torcnia fournieri</i> and <i>T. flava</i>
	<i>Tropeolum majus</i> (nasturtium)

FLOWERING PLANTS OFTEN USED AS POTTED PLANTS (in addition to those listed for hanging baskets); mostly limited to glasshouse or inside culture.

<i>Aporocactus flagelliformis</i> (rat-tail cactus)	<i>Strclitzia reginae</i> (bird-of-paradise flower)
<i>Epiphyllum</i> (<i>Phyllocactus</i>) and hybrids	<i>Zantedeschia elliottiana</i> (golden or yellow calla)
<i>Hippeastrum hybrids</i> (hybrid amaryllis)	<i>Zygocactus truncatus</i> (Christmas or crab cactus)

PLANTS WITH FRAGRANT FLOWERS

HERBACEOUS PLANTS

<i>Cattleya</i> , <i>Laelia</i> , and other orchids	<i>Lobularia maritima</i> (sweet alyssum)
<i>Centaurea moschata</i> (sweet sultan)	<i>Mathiola</i> (stock)
<i>Convallaria</i> (lily-of-the-valley)	<i>Narcissus odoratus</i> (campernelle)
<i>Dianthus caryophyllus</i> (carnation) and <i>D. plumarius</i> (spice pink)	jonquil)
<i>Freesia</i>	<i>Pconia</i> (herbaceous peony)
<i>Hyacinthus</i> (hyacinth)	<i>Pctunia</i>
<i>Lathyrus odorata</i> (sweet pea)	<i>Polianthes</i> (tuberose)
<i>Lilium</i> (lily); most species	<i>Verbena</i>
	<i>Viola odorata</i> (violet)

WOODY PLANTS

<i>Acacia baileyana</i> and other species of acacia	<i>Lonicera japonica</i> (Japanese honeysuckle)
<i>Boronia megastigma</i> (brown boronia)	<i>Mandevilla suaveolens</i> (Chile jasmine)
<i>Bouvardia</i> ; white hybrid	<i>Philadelphus</i> (syringa)
<i>Cestrum diurnum</i> (day jasmine) and <i>C. nocturnum</i> (night jasmine)	<i>Pittosporum undulatum</i> (sweet pittosporum)
<i>Citrus aurantium</i> (orange)	<i>Prunus lannesiana</i> (Japanese cherry)
<i>Daphne odora</i> (daphne)	<i>Rosa</i> ; especially tea and hybrid tea varieties of roses
<i>Gardenia jasminoides</i> (gardenia or Cape jasmine)	<i>Spartium junceum</i> (Spanish broom)
<i>Gelsemium</i> (Carolina yellow jessamine)	<i>Stephanotis floribunda</i>
<i>Heliotropium peruvianum</i> (heliotrope)	<i>Syringa vulgaris</i> (lilac)
<i>Jasminum</i> (jasmine)	<i>Trachelospermum</i> (star jasmine)
<i>Lavandula</i> (lavender)	<i>Viburnum carlesii</i> and <i>V. fragrans</i>
	<i>Wistaria sinensis</i> (Chinese wistaria)
	<i>W. floribunda</i> (Japanese wistaria)

FLOWERS VALUED FOR CUT BLOOM

HERBACEOUS PLANTS

Alstroemeria (Peruvian lily)
Antirrhinum (snapdragon)
Aquilegia (columbine)
Aster; perennial (michaelmas daisy)
Calendula (pot marigold)
Callistephus chinensis (China aster)
Campanula medium (Canterbury bells) and other species
Canna
Centaurea cyanus (corn flower) and *C. moschatus* (sweet sultan)
Chrysanthemum; annual and perennial species
Convallaria (lily-of-the-valley)
Coreopsis tinctoria (calliopsis), *C. lanceolata*, and *C. grandiflora* (coreopsis)
Cosmos
Cyclamen
 Daffodils—see *Narcissus*
Dahlia
Delphinium; annual and perennial species of larkspur
Dianthus; especially carnations and pinks
Dicentra (bleeding heart)
Doronicum (leopard's bane)
Eschscholtzia (California poppy)
Freesia
Gaillardia
Gerbera jamesoni (Transvaal daisy)
Geum chiloense (geum)
Gladiolus
Godetia
Gypsophila (baby's breath)
Heuchera sanguinea (coral bells)

Hyacinthus orientalis (hyacinth)
Iris, especially *I. germanica*, *I. unguicularis*, *I. sibirica*, *xiphium* hybrids, and *I. orientalis*
 Jonquil—see *Narcissus*
Lathyrus odorata (sweet pea)
Lilium, especially *L. longiflorum*, *L. candidum*, *L. speciosum*, and *L. regale*
Mathiola incana (stock)
Narcissus jonquilla (jonquil), *N. tazetta* (polyanthus narcissus), *N. pseudo-narcissus* (daffodil) and other species
Peonia albiflora (herbaceous peony)
Papaver nudicaule (Iceland poppy)
Phlox paniculata (summer perennial phlox)
Polianthes tuberosa (tuberose)
Ranunculus asiaticus (ranunculus)
Reseda odorata (mignonette)
Salvia, especially *S. leucantha*, *S. nemorosa*, and *S. azurea* (sage)
Scabiosa, especially *S. atropurpurea*, *S. caucasica*, and *S. columbaria*
Schizanthus wisetonensis and hybrids (butterfly flower)
Tagetes (French and African marigold species)
Thalictrum dipterocarpum and *T. aquilegifolium* (meadow rue)
Tritonia hybrids (montbretia)
Viola odorata (violet), *V. cornuta* (tufted pansy or viola), *V. tricolor* var. *hortensis* (pansy)
Zinnia elegans

WOODY PLANTS

Acacia baileyana and *A. pravissima*
Camellia japonica (fig. 29)
Ceanothus aboreus (wild lilac)
Chaenomeles japonica (Japanese quince)
Chorizema ilicifolium (holly pea or flame pea)
Cotoneaster pannosa and *C. hero-veana*; for berries
Daphne odora
Deutzia scabra and other species
Erica melanthera
Eucalyptus ficifolia (red-flowered gum) and *E. leucoxydon rosea*
Kolkwitzia amabilis (beauty bush)
Nerium oleander (oleander)
Photinia arbutifolia (toyon); valued for the berries

Prunus triloba (flowering almond), *P. cerasifera* var. *blirieana* (flowering plum), *P. mume* (flowering apricot), *P. persica* (flowering peach), *P. serulata* (Japanese flowering cherry), *P. subhirtella* var. *pendula* (Japanese weeping rose-flowered cherry), and other species of flowering cherries
Pyracantha angustifolia, *P. gibbsii* var. *yunanensis*, and *P. formosana*; (firethorn); valued for the berries
Pyrus spectabilis (Chinese flowering apple), *P. ioensis* (Bechtel's flowering crab), *P. pulcherrima* (showy crab), and several horticultural varieties within the species listed
Rhododendron and *Azalea*
Rosa (rose)

Spirea prunifolia (bridal wreath), *S. vanhouttei*, *S. bumalda*, and other species
Symphoricarpos orbiculatus (Indian-currant) and *S. albus* (snowberry); valued for the berries

Syringa vulgaris (lilac)
Wistaria floribunda (Japanese wistaria) and *W. sinensis* (Chinese wistaria)

PROPAGATION OF FLOWERING PLANTS

PROPAGATION BY CUTTINGS OR VEGETATIVE PARTS

Many kinds of flowering plants are propagated from parts of the stem, roots, or leaves. Divisions, offsets, offshoots, suckers, and layers, in addition to the simple stems, roots, or leaves, are utilized. Certain kinds of cuttings should be taken while the wood is still growing, either while soft or after it has hardened. The subsequent treatment of the cuttings also varies with the plant. Plants propagated by each of the various methods are listed below. Some are propagated by more than one method.

Soft green cuttings (see fig. 7)

<i>Abutilon</i>	<i>Felicia</i>	<i>Mahernia</i>	<i>Scabiosa</i>
<i>Arabis</i>	<i>Forsythia</i>	<i>Malvariscus</i>	<i>Sedum</i>
<i>Aubretia</i>	<i>Fuchsia</i>	<i>Mesembryanthe-</i>	<i>Sophora</i>
<i>Boronia</i>	<i>Gerbera</i>	<i>mum</i>	<i>Sparmannia</i>
<i>Cactus</i>	<i>Helianthemum</i>	<i>Pentstemon</i>	<i>Streptosolen</i>
<i>Calceolaria</i>	<i>Hibiscus</i>	<i>Petunia</i>	<i>Tecoma</i>
<i>Chrysanthemum</i>	<i>Hypericum</i>	<i>Phlox</i>	<i>Verbena</i>
<i>Cytisus</i>	<i>Kerria</i>	<i>Pimelea</i>	<i>Veronica</i>
<i>Dahlia</i>	<i>Lantana</i>	<i>Rehmannia</i>	<i>Viburnum</i>
<i>Dianthus</i>	<i>Leptospermum</i>	<i>Rochea</i>	<i>Viola</i>
<i>Erica</i>	<i>Linum</i>	<i>Salvia</i>	

Hardened green cuttings

<i>Abelia</i>	<i>Deutzia</i>	<i>Jacaranda</i>	<i>Pelargonium</i>
<i>Azalea</i>	<i>Diervilla</i>	<i>Jasminum</i>	<i>Pernetia</i>
<i>Boronia</i>	<i>Escallonia</i>	<i>Lavandula</i>	<i>Rosa</i>
<i>Buginvillea</i>	<i>Eugenia</i>	<i>Lavatera</i>	<i>Solandra</i>
<i>Camellia</i>	<i>Forsythia</i>	<i>Leonotis</i>	<i>Solanum</i>
<i>Cassia</i>	<i>Grevillea</i>	<i>Mahonia</i>	<i>Spirea</i>
<i>Chorizema</i>	<i>Hibiscus</i>	<i>Mahernia</i>	<i>Stephanotis</i>
<i>Cistus</i>	<i>Hoya</i>	<i>Mandevilla</i>	<i>Syringa</i>
<i>Clerodendron</i>	<i>Hydrangea</i>	<i>Myrtus</i>	<i>Tibouchina</i>
<i>Cytisus</i>	<i>Ilex</i>	<i>Nerium</i>	<i>Trachelospermum</i>
<i>Daphne</i>	<i>Ipomea</i>		

Ripened wood cuttings rooted in the open

<i>Azalea</i>	<i>Hydrangea</i>	<i>Lonicera</i>	<i>Rhododendron</i>
<i>Berberis</i>	<i>Kerria</i>	<i>Lotus</i>	<i>Rosa</i> (fig. 8)
<i>Chaenomeles</i>	<i>Kolkwitzia</i>	<i>Philadelphus</i>	<i>Salix</i>
<i>Diervilla</i>	<i>Lagerstremia</i>	<i>Polygonum</i>	<i>Spirea</i>
<i>Duranta</i>	<i>Leptospermum</i>	<i>auberti</i>	<i>Tamarix</i>
<i>Fuchsia</i>	<i>Ligustrum</i>	<i>Punica</i>	

Layers

Akebia
Aubretia
Berberis
Cantua
Cistus

Cornus
Cotoneaster
Daphne
Echium
Euonymus

Hoya
Laburnum
Lonicera
Magnolia
Mandevilla

Nerium
Parthenocissus
Philadelphus
Pyracantha
Robinia



Fig. 8.—The dormant rose cutting cut just above and just below a bud. Buds beneath the surface are removed when budding or grafting is to be practiced. The cutting should be about the diameter of a pencil and well matured from past season's growth.

Simple division

Agave
Aloe
Amaryllis
Anchusa
Anemone
Aquilegia
Arabis
Armeria
Aster
Astilbe
Aubretia
Bauhinia
Berberis
Campanula
Canna
Chrysanthemum

Cornus
Cotyledon
Cyperus
Dahlia
Delphinium
Dianthus
Dicentra
Doronicum
Echinops
Eremurus
Erigeron
Erythrina
Gaillardia
Gazania
Geum

Gypsophila
Helenium
Helianthemum
Helleborus
Heuchera
Hydrocleis
Hypericum calycinum
Iris
Kerria
Laburnum
Leucothoe
Linum
Mahonia
Musa

Nymphaea
Peonia
Paulownia
Philadelphus
Phlox
Potentilla
Primula
Rudbeckia
Scabiosa
Sedum
Sempervivum
Statice
Strelitzia
Thalictrum
Zantedeschia

PROPAGATION BY SEED

Annuals or plants started from seed each year are valuable for giving a quick effect in the garden and also for adding color to new plantings of shrubs. Since there is much in common between these annuals, general methods of propagation are given. Seasonal differences are indicated in the planting calendar (p. 51) and special hints on certain flowers are given later. The equipment required is briefly described under "Equipment for Propagating Plants" (p. 20).

Annuals do best when grown from fresh seed planted where there will be good aeration, a good growing temperature, sufficient light, and properly regulated moisture conditions.

The great majority of flower seeds germinate best when planted in a seed flat or seed pan, but a few annuals like sweet peas are planted in the open. The seeds of plants which are resistant to cold and variable weather conditions or soil moisture can often be planted in the open; in fact, most of the California wild flowers, such as California poppies, godetias, and clarkias, and some other annuals, such as Virginian stocks (*Malcomia maritima*), shirley poppies, and candy-tuft, are planted in the open more often than in flats. If there is adequate moisture for them, the Virginian stocks may be grown in the bed where tulips, daffodils, irises, and similar plants have been growing.

Very cool unfavorable growing conditions, either in the flat or in the open, will favor poor growth and disease. Little or nothing is to be gained by planting pansies, sweet peas, or snapdragons when growing conditions are unfavorable. It would be much better to wait until the weather warms up in the spring than to plant in the fall and then have the seedlings stand still for several weeks. In a heavy soil, sweet peas often do far better as a spring crop than as a fall crop, owing mostly to the cold wet condition in the soil. Such conditions should be taken into consideration when planting flower seeds and planning a program for the garden.

Soil for Growing Seeds.—Many of the common flower seeds do well when planted in a mixture of 2 parts good garden loam, 1 part sharp river sand (No. 2), and 1 part leaf mold. The mixture should be sifted through a $\frac{1}{8}$ -inch mesh sieve to supply fine material for the upper half of the seed pan or flat. The coarser material that does not pass through the sieve will do very well for the bottom part of the flat or pan. No manure is needed in the mixture, in fact, it is a serious mistake

to add manure at the time of planting the seed. All manure added to loam soils should be added well in advance of seed-planting time so that there will be a minimum of danger from damping-off fungi and decaying material about the seeds.

Special kinds of seeds will require a somewhat different mixture than that given above. Cacti¹⁷ and various other drouth-resistant plants seem to demand a very well-drained soil. If a seed pan with a single hole in the bottom is used, it is best to enlarge the hole somewhat. The bottom of the pan is filled with broken crock or pot to one-fourth the depth of the pan, then rotted sod is sifted through a $\frac{1}{8}$ -inch sieve and the pan filled within about one inch of the top. A pan 4 inches deep has been recommended, but a pan even deeper, $4\frac{1}{2}$ to 5 inches, does well. This depth gives the best drainage.

The Planting and Care of Seed.—If the bottom of the seed flat does not have cracks that will insure adequate drainage, $\frac{3}{4}$ -inch holes are bored for this purpose. Seed pans come with one or more holes in the bottom. Over the holes should be laid broken pieces of pots so that the pieces will allow water to pass out. At the same time these pieces will hold the soil in. The sifted soil is added as required.

Some growers suggest firming the top of the soil with a cylindrical block before planting the seed, but the same purpose can be served by jarring the pot on a bench so that the surface of the soil in the pot is level. The seed can then be planted and a little sifted soil or plain sand scattered over it until it is at the proper depth. The sand (No. 2) may be placed in a Mason jar and holes punched in the top so it can be sifted over the seed or over the sifted loam covering the seed. A sandy surface is freer from algae and less likely to be troubled with the damping-off fungus than a loam surface. Drainage about the seeds is usually good. If a very coarse top surface is needed, as in the case of cactus seed, then fine gravel can be scattered over the surface.

Very fine seed is planted shallow, larger seed deeper. In most cases the directions on the seed packets suggest a certain depth. Many of the smallest seeds should be covered only very lightly with the sand. Other seeds may be covered about $\frac{1}{8}$ inch and the larger seeds can be covered as much as $\frac{1}{4}$ inch. In the case of seeds like the gladiolus there is a tendency for the roots to pull the small bulblets down to the proper depth if it is not right at the start. A general rule is to cover

¹⁷ For details on planting cactus see: Griffiths, David. Cacti. U. S. Dept. Agr. Cir. 66: 1-25. 19 plates. 1929. (25 cents a copy from U. S. Supt. of Documents, Washington, D. C.)

the seed to a depth equal to about twice the breadth of the seed. There is more danger of planting too deep in heavy soil than in light soil or sandy soil. After the seed is sifted over the soil surface and covered it can be gently pressed with the block. It is a little easier to distribute properly the seed by firming with the block after planting than before.

In the great majority of cases the planted seed needs no surface mulch of any kind, some of the wild lilies in the redwoods of California being possible exceptions. In the latter case a fine mulch of German peat may aid in securing quick germination. If the seed is not kept very moist it may take at least a year to germinate. Protection against a hot sun will be mentioned shortly. A piece of glass placed over the seed pot or flat will insure humidity and preserve heat.

After the seed has been planted, the pan or flat should be set in 2 or 3 inches of water so that the whole soil mass will be wet thoroughly. Wetting the soil in this manner is much better than sprinkling. Even gentle sprinkling may float some of the seeds to the top and dislodge others. Furthermore, covering the top with water may cause air bubbles to form and disturb some of the seed. After the seed has been thoroughly wet the flat or pan should be set away for germination.

Sterilizing¹⁸ soil in a soil sterilizer or by means of one of the organic mercury compounds or possibly by hot water, steam, or formalin might be considered in special cases where there is extreme difficulty about damping-off.

Protection Against a Hot Sun or Strong Light.—Most seeds germinate best when darkened. Strong sunlight is objectionable. The pot, pan, or flat may be covered with wrapping paper or newspaper to exclude strong light, but air should not be entirely excluded. Setting the seed flat away on a shelf in a darkened basement works very well if it is removed to the light as soon as the seedlings begin to break the soil surface. Seeds planted in the open or in flats may be covered with burlap to provide shade until the seedlings begin to show. This covering is very important during the hot summer months when the soil surface bakes very easily and interferes with proper germination. During the germination process the seed should be kept warm and moist. Daily sprinkling is advisable for many seeds; others will not require watering oftener than two or three times a week. Small seeds should be watered rather frequently. Seeds of the gladiolus or similar bulbs seem to germinate best when kept very wet. A cold frame helps germination a great deal early in the season when the weather is cool.

¹⁸ See also: Beinhart, E. G. Steam sterilization of seed beds for tobacco and other crops. U. S. Dept. Agr. Farmers' Bul. 996:1-15. 1918.

The critical time for many flowering plants is during the first two weeks after germination. Any abnormal drying, sunburn, low or high temperatures, or very great changes in temperature will be likely to cause high mortality. A difference of 10 degrees Fahrenheit in temperature between night and day is not harmful, but great changes favor certain soil diseases such as damping-off. Much of this trouble can be avoided by growing the seedlings where they are protected from excessive temperature changes, and by closely watching the air and moisture. A close, damp atmosphere is ideal for the injurious soil fungi. If the surface of the seed flat or pan is sprinkled with sand or fine gravel it will dry off quickly after watering. Watering should be thorough when done, and then no more water should be added until the soil has again dried out to some extent. Shallow, frequent watering of young seedlings is a very dangerous practice. The seedling roots need to grow down and this is impossible where the soil beneath is kept saturated or remains dry. Experience will be needed to tell just when the seedlings need more water but it is less dangerous to water too little than too frequently. Some kinds of plants like the hothouse calceolarias are very particular about their watering and can be easily killed by watering twice a day when once is ample. Careful watch should be kept of all the young seedlings and if a few show signs of wilting and damping-off they should be put in a place with more air and watered less often. Just this little change may be all that is necessary, but in some kinds of plants extra precautions may be needed.

The gardener has to choose between the perfect ventilation outside accompanied with wind and sun damage and the imperfect ventilation of the greenhouse and cold frame where it is considerably easier to regulate heat and moisture. He may have access to a greenhouse, a lath-house, or a cold frame, or at least some sheltered spot in the garden where the seedlings may be kept until they are ready for transplanting to flats or the open ground. The seedlings may be shifted as experience dictates. Damping-off of seedlings like those of petunias, delphiniums, and poppies can be partially avoided by giving more ventilation and by planting a little farther apart in the seed bed.

*Transplanting Seedlings to Flats.*¹⁹ As the seeds germinate in the seed pan or the seed flat they are usually too close to grow well for any great length of time. Transplanting the seedlings to flats will give them better aeration and more room for root development. The old

¹⁹ For trees and shrubs see: Mulford, F. L. Transplanting trees and shrubs. U. S. Dept. Agr. Farmers' Bul. 1591:1-34. 1929.

claim that transplanting gives a better root system is probably true, but not for the reason sometimes offered; there is evidence that the cutting back of the roots does not directly favor a better root system. However, if transplanting to flats does actually result in better growth then the practice is well justified. Transplanting to flats is universal among nurserymen and it fits in well with ordinary practice in the home garden. Closer attention can be given to the needs of the transplanted seedlings in flats than in the open ground. While it is true that some kinds of flowers—for example, sweet peas and calendulas—seem to give just as good results when planted directly into the open ground as when transplanted, still there are many others which will give superior results in the open after first being transplanted once or twice into seed flats. Certain other kinds of flowers fail to thrive if transplanted after they have reached considerable size. *Schizanthus* seedlings are an example. If transplanted when very young there will be little loss and the plants can be made to continue growth uninterrupted. They may be transplanted to pots and the potted plants taken to the open at blooming time, or the seedlings may be planted directly in the open ground when planting conditions are favorable.

The standard flat is large enough to hold 60 to 75 plants of most seedlings. A month to six weeks, or at most two months, should be sufficient for the flat culture of ordinary annuals and herbaceous perennials. By that time the plants in the flat will need more room. Leaving the plants in the flat for a longer period will probably so stunt them that they will not do well after planting in the open. Snapdragons and similar ornamentals subject to certain rusts are much more likely to be attacked if stunted than if they are allowed to make a good healthy growth.

The seedlings in flats should be hardened before transplanting to the open ground. A week in the open sun with only a moderate amount of water will slow down growth so that there will be minimum shock in transplanting. Succulent seedlings or rooted cuttings may be pinched back to counteract any loss of roots. Shading the first day or two is another guard against loss. The soil about the roots of all newly planted ornamentals should be firmed so that it will come into close contact with the feeding roots. Watering will aid in settling the soil.

Viability of Seeds.—Seeds capable of germination are said to be viable. Most seeds sold have been tested for their ability to germinate under proper conditions; reliable seedsmen pride themselves on the

sale of only good flower seed. It pays to buy from seedsmen who are registered with the state and have established a good reputation.

Occasionally seeds are harvested too green, or are kept too long before planting. Some seeds are injured during the harvesting and handling process. But the tendency of the beginner to blame the seed for failure to germinate is not very often justified. It is more likely that he has failed in one or more respects to give the seed the proper environment for successful germination. This includes moisture, heat, air, and light. In some cases parasites attack the seed before the sprout reaches the surface. Seeds planted when the ground is cold and wet have a very poor chance to germinate.

Time for Seed Germination.—Records of seed germination are largely limited to vegetable and weed seeds. Many flower growers know the time it takes for various flower seeds to germinate, but the facts have not been published in most cases. The records listed in table 3 are only approximate. With the optimum degree of temperature, the proper depth for planting, sufficient moisture and air, and fresh seed, germination will be most rapid. Old seed takes longer to germinate than fresh seed as a general rule. For example, some lily seed and dry orange, peach, or plum seed may not germinate until the second or even the third year. Some iris seed that fails to germinate the first year may scatter along until the fourth year. Delphinium seed germinates very well when planted soon after harvesting, as in August. These differences should be borne in mind when studying the table; the range listed may need to be lengthened to meet some conditions.

TABLE 3

GERMINATION PERIOD FOR VARIOUS FLOWERING PLANTS
(Based on California experience under favorable conditions)

<i>Acacia</i>	3 weeks or more	<i>Cymbalaria muralis</i> (Kenilworth ivy).....	5-7 days
<i>Ageratum</i>	5-7 days	Cypress vine, see <i>Quamoclit</i>	
<i>Althea rosea</i> (holly- hock).....	5-7 days	<i>Dahlia</i>	5-10 days
<i>Antirrhinum</i> (snap- dragon).....	3 weeks	<i>Datura</i>	2 weeks
<i>Anchusa</i>	3 weeks	<i>Delphinium</i>	2 weeks or more
<i>Arctotis</i>	3 weeks	<i>Dianthus barbatus</i> (sweet william).....	10-14 days
<i>Aster</i> (michaelmas daisy).....	2 weeks or more	<i>D. caryophyllus</i> (car- nation).....	1 month
See also <i>Callistephus</i> (China aster)		<i>D. plumarius</i> (spice pink).....	5-7 days
<i>Babiana</i>	6-8 weeks	<i>Digitalis</i> (foxglove).....	3 weeks
Balsam, see <i>Impatiens</i>		<i>Echinocactus</i> (golden cactus).....	5-20 days or more
<i>Begonia</i>	3-4 weeks	<i>Eschscholtzia</i> (Califor- nia poppy).....	8 days
<i>Bellis</i> (daisy).....	5 days	<i>Eucalyptus</i>	6 weeks or more
<i>Browallia</i>	3 weeks	Fern, see <i>Polypodium</i>	
Cactus, see <i>Opuntia</i> , <i>Cephalocereus</i> , and <i>Echinocactus</i>		Feverfew, see <i>Chrysanthemum</i>	
<i>Calceolaria</i>	4 weeks	<i>Gaillardia</i>	3 weeks
<i>Calendula</i>	7-10 days	<i>Gerbera</i> (Transvaal daisy).....	3 weeks
<i>Callistephus chinensis</i> (China aster).....	2 weeks	<i>Geum</i>	10 days or more
<i>Calonyction</i> (moon- flower).....	3 weeks	<i>Gladiolus</i>	2 to 8 weeks
<i>Campanula medium</i>	2 weeks	<i>Godetia</i>	2 weeks
some species.....	8 days	Gourd, see <i>Lagenaria</i>	
Candytuft, see <i>Iberis</i>		<i>Gypsophila</i>	3 weeks
<i>Canna</i>	15 days or more	<i>Helianthus annuus</i> (sunflower).....	2 weeks
Carnation, see <i>Dianthus</i>		<i>Helichrysum</i> (straw- flower).....	5-7 days
<i>Ceanothus</i>	2-3 months	<i>Heuchera</i>	3 weeks
<i>Celosia argentea</i> var. <i>cristata</i> (cockscorn).....	3 weeks	<i>Hibiscus</i>	2 weeks or more
<i>Centourea</i> species.....	5 days	<i>Hippeastrum</i> (hybrid amaryllis).....	3-4 weeks
<i>Cephalocereus senilis</i> (old man cactus).....	5-20 days or more	Hollyhock, see <i>Althea</i>	
<i>Cheiranthus cheiri</i> (wall-flower).....	5-7 days	<i>Hunnemannia</i>	8 days
<i>Chrysanthemum coccid- neum</i> (pyrethrum).....	2-3 weeks	<i>Iberis</i> (candytuft).....	5 days
<i>C. maximum</i> (Shasta daisy).....	3 weeks	<i>Ipomea</i> , with heat.....	4 weeks or more
<i>C. morifolium</i> (flor- ists' chrysanthem- um).....	5 days or more	See also <i>Calonyction</i>	
<i>C. parthenium</i> (fever- few).....	3 weeks	<i>I. purpurea</i> (morning glory).....	5 days or more
<i>Cineraria</i>	5-10 days	<i>Impatiens</i>	2 weeks
<i>Clematis</i>	3 months to over 1 year	<i>I. balsamina</i> (balsam) <i>Iris germanica</i>	10 days or more 15 days to 3 mos. or more
<i>Cleome</i>	3 weeks	Kenilworth ivy, see <i>Cymbalaria</i>	
<i>Cobea scandens</i>	2 weeks	<i>Kochia scoparia</i> (sum- mer cypress); for colored foliage.....	2 weeks
Cockscorn, see <i>Celosia</i>		<i>Lachenalia</i> (Cape cow- slip).....	4 weeks
<i>Coreopsis</i>	3 weeks	<i>Lagenaria</i> (dipper gourd).....	2 weeks
<i>Cosmos</i>	5-7 days	Larkspur, see <i>Delphinium</i>	
<i>Cotoneaster</i>	15 days or more		
<i>Cyclamen</i>	4 weeks		

TABLE 3—(Concluded)

<i>Lathyrus latifolius</i> (perennial sweet pea).....	3-4 weeks
<i>L. odoratus</i> (sweet pea).....	2 weeks
<i>Lavandula</i> (lavender).....	3 weeks
<i>Lilium</i> , most cultivated species.....	2-6 weeks
<i>L. auratum</i> , <i>L. humboldti</i> , and a few other species may require.....	1 year or more
<i>Linaria</i>	5-7 days
<i>Linum</i> (flax).....	10 days
<i>Lobelia</i>	10 days
<i>Lobularia maritima</i> (sweet alyssum).....	5-7 days
<i>Lychnis</i>	3 weeks
<i>Malcomia maritima</i> (Virginian stock).....	5-7 days
Marigold, see <i>Tagetes</i> and <i>Calendula</i>	
<i>Mathiola</i> (stock).....	5-10 days
<i>Maurandia</i>	3-4 weeks
<i>Mesembryanthemum</i>	5-7 days
Mignonette, see <i>Reseda</i>	
<i>Myosotis</i> (forget-me-not).....	2 weeks
Moonflower, see <i>Calonyction</i>	
Morning-glory, see <i>Ipomea purpurea</i>	
Nasturtium, see <i>Tropeolum majus</i>	
<i>Nemesia</i>	10-15 days
<i>Nicotiana</i> (flowering tobacco).....	3 weeks
<i>Nigella</i> (love-in-a-mist).....	10 days
<i>Oenothera</i> (evening primrose).....	5-7 days
<i>Opuntia</i> (prickly pear cactus).....	5-20 days
Pansy, see <i>Viola</i>	
<i>Papaver nudicaule</i> (Iceland poppy).....	2-3 weeks
Peach, see <i>Prunus</i>	
<i>Peonia suffruticosa</i> (tree peony).....	3 months or more
<i>Pentstemon</i>	2 weeks
<i>Petunia</i>	3 weeks
<i>Phaseolus coccineus</i> (scarlet runner bean).....	7 to 10 days
<i>Phlox</i>	3 weeks
Pink, see <i>Dianthus</i>	
<i>Platycodon</i> (balloon flower).....	1 month or more
Plum, see <i>Prunus</i>	
<i>Polypodium</i> and other fern spores.....	15-30 days
Poppy, see <i>Papaver</i> , <i>Eschscholtzia</i> , <i>Hunnemannia</i> , and <i>Romneya</i>	
<i>Portulaca</i>	3 weeks
<i>Primula</i> (primrose).....	2 weeks
<i>Prunus persica</i> (peach) and <i>P. cerasifera</i> (cherry plum).....	3-12 months
<i>Pyracantha</i> (firethorn).....	2-6 weeks
Pyrethrum, see <i>Chrysanthemum coccineum</i>	
<i>Quamoclit pennata</i>	5-7 days
<i>Reseda</i> (mignonette).....	5-7 days
<i>Romneya</i> (matilija or tree poppy).....	6-12 weeks or more
<i>Salpiglossis</i>	5-7 days
<i>Scabiosa</i>	3 weeks
Scarlet runner bean, see <i>Phaseolus</i>	
<i>Schizanthus</i> (butterfly flower).....	3 weeks
Shasta daisy, see <i>Chrysanthemum maximum</i>	
Snapdragon, see <i>Antirrhinum</i>	
Stocks, see <i>Mathiola</i>	
<i>Strelitzia</i> (bird-of-paradise flower).....	4 months
<i>Streptanthus cuprea</i>	4-6 weeks
Sunflower, see <i>Helianthus</i>	
Sweet alyssum, see <i>Lobularia</i>	
Sweet pea, see <i>Lathyrus</i>	
Sweet william, see <i>Dianthus</i>	
<i>Thalictrum</i>	2-6 weeks
<i>Trachymene</i> (blue lace flower or didiscus).....	2 weeks
<i>Tropeolum majus</i> (nasturtium).....	8 days
<i>Verbascum phoeniceum</i> (purple mullein).....	8-10 days
<i>Verbena</i>	8-10 days
<i>Viola tricolor</i> var. <i>hortensis</i> (pansy).....	10-14 days
<i>V. cornuta</i> (tufted pansy).....	2-3 weeks
Wallflower, see <i>Cheiranthus</i>	
<i>Zinnia</i>	5-7 days

PLANTING CALENDAR FOR THE YEAR

Consideration has already been given to the selection of flowering plants for many purposes. The home gardener also has need for a planting calendar that will at least suggest what seeds, bulbs, roots, and nursery seedlings may be planted during any current month. The time may vary a month or more in some cases according to how late or how early the frosts may be in a community or in a garden. Only the more common plant materials will be included in the planting calendar. The seeds may be secured from any seed store. The bulbs and roots will be available at seed stores and nurseries. The list of plants to be transplanted will include those which are generally sold in flats at local nurseries. Similar plants grown from seed in home gardens should be transplanted at the proper time. There will be many kinds of flowers available for planting that are less common, yet no less desirable. All plants named have been listed by California firms and should be available. Each home gardener may add to the list in the calendar.

In using the planting calendar the reader may glance through the lists for the current month and select those flowers which are of most interest. The flowers are arranged alphabetically under the botanical names. Common names are given in parenthesis except when the botanical name is better known than any common name. Where there are both annual and perennial varieties of a plant the annuals will be marked (*a*) and the perennials (*p*). All flowers the seed of which should be planted in seed flats, seed pans, or pots are marked (*f*), even though some of these may do moderately well when planted in the open ground.

JANUARY

SEEDS

<i>Abronia</i> (sand verbenas)	<i>Godetia</i>
<i>Achillea</i> (f)*	<i>Gypsophila elegans</i> (a; f) and <i>G.</i>
<i>Antirrhinum</i> (snapdragon) (f)	<i>paniculata</i> (baby's breath) (p; f)
<i>Aquilegia</i> (columbine) (f)	<i>Helenium</i>
<i>Arctotis</i> (African blue daisy) (f)	<i>Helipterum</i> (<i>Acroclinium</i>) <i>roseum</i>
<i>Bartonia</i>	(f)
<i>Bellis perennis</i> (English daisy) (f)	<i>Lathyrus odorata</i> (sweet pea)
<i>Calendula</i> (pot marigold) (f)	<i>Lobularia maritima</i> (sweet alyssum)
<i>Campanula medium</i> (Canterbury bells) (f)	<i>Lunaria</i> (honesty plant) (f)
<i>Celosia</i> (cockscorn or other species) (f)	<i>Lupinus</i> (lupin) (f)
<i>Centaurea</i> (f)	<i>Minulus moschatus</i> (musk plant) (a; f)
<i>Cheiranthus</i> (wallflower) (f)	<i>Myosotis</i> (forget-me-not) (f)
<i>Chrysanthemum carinatum</i> (f; a)	<i>Nemophila insignis</i> (baby blue-eyes)
(tricolor chrysanthemum)	<i>Nigella damascena</i> (love-in-a-mist) (f)
<i>Clarkia</i>	<i>Papaver nudicaule</i> (Iceland poppy)
<i>Clematis</i> (f)	(p; f), <i>P. rheas</i> (shirley poppy) (a)
<i>Coreopsis lanceolata</i> and <i>C. grandiflora</i> (f; a)	or other species
<i>Cotoneaster</i> (f)	<i>Pentstemon</i> (f)
<i>Cyclamen</i> (f)	<i>Puraria</i> (kudzu vine) (f)
<i>Delphinium ajacis</i> (larkspur) (a; f)	<i>Pyracantha</i> (f)
<i>Dianthus plumarius</i> (pink) (f; p)	<i>Reseda</i> (mignonette)
<i>D. caryophyllus</i> (carnation) (f; p)	<i>Salvia</i> (flowering sage) (f)
<i>Dolichos lignosus</i> (Australian pea)	<i>Scabiosa</i> (a and p; f)
<i>Eschscholtzia</i> (California poppy)	<i>Schizanthus</i> (butterfly flower) (f)
<i>Gilia</i>	<i>Statice</i> (f)

BULBS AND ROOTS

<i>Agapanthus</i>	<i>Leucojum</i> (snowflake)
<i>Alstroemeria</i> (Peruvian lily)	<i>Lilium regale</i> (regal lily) or other
<i>Amaryllis belladonna</i>	hardy species
<i>Anemone</i>	<i>Narcissus pseudo-narcissus</i> (daffodil),
<i>Astilbe</i> (herbaceous spirea)	<i>N. tazetta</i> (China lily), and others
<i>Begonia</i> ; tuberous-rooted	<i>Ornithogalum</i>
<i>Boussingaultia</i> (Madeira vine)	<i>Peonia</i> (peony)
<i>Canna</i>	<i>Platycodon</i> (balloon flower)
<i>Convallaria</i> (lily-of-the-valley)	<i>Polianthes</i> (tuberose)
<i>Crocus</i>	<i>Ranunculus</i>
<i>Cyclamen</i>	<i>Sparaxis tricolor</i>
<i>Dicentra</i> (bleeding heart)	<i>Tigridia</i> (tiger flower)
<i>Dierama</i>	<i>Tritonia hybrid</i> (montbretia)
<i>Discorea batatas</i> (cinnamon vine)	<i>Tulipa</i> (tulip)
<i>Freesia</i>	<i>Watsonia</i>
<i>Galanthus</i> (snowdrop)	<i>Zantedeschia</i> (calla)
<i>Hyacinthus</i> (hyacinth)	<i>Zephyranthes candida</i> (zephyr lily)
<i>Ixia</i>	

* a—annual species; p—perennial species; f—plant in flat.

TRANSPLANTING

<i>Aquilegia</i> (columbine)	Evergreen trees and shrubs; hardy species only
<i>Antirrhinum</i> (snapdragon)	<i>Mathiola incana</i> (stock)
<i>Campanula medium</i> (Canterbury bells)	<i>Pentstemon</i>
<i>Chrysanthemum maximum</i> (Shasta daisy)	<i>Petunia</i>
<i>Dianthus caryophyllus</i> (carnation)	<i>Primula</i> (primrose)
and <i>D. plumarius</i> (pink)	<i>Rosa</i> (rose)
Deciduous flowering trees and shrubs, or hardy vines	<i>Verbena</i>
	<i>Viola tricolor</i> var. <i>hortensis</i> (pansy)

FEBRUARY

SEEDS

<i>Abronia</i> (sand verbena) (f) *	<i>Dimorphotheca aurantiaca</i> (f)
<i>Abutilon</i> hybrids (f; a)	<i>Dolichos lignosus</i> (Australian pea)
<i>Achillea</i> (f)	<i>Eschscholtzia</i> (California poppy)
<i>Ageratum</i> (floss flower) (f)	<i>Gaillardia pulchella</i> (a) and <i>G. aristata</i> (p; f)
<i>Althea rosea</i> (hollyhock) (f)	<i>Gerbera</i> (f)
<i>Anchusa</i> (f)	<i>Geum</i> (f)
<i>Antirrhinum</i> (snapdragon) (f)	<i>Gilia</i>
<i>Aquilegia</i> (columbine) (f)	<i>Gloxinia</i> (f)
<i>Arctotis</i> (African blue daisy) (f)	<i>Godetia</i> (f)
<i>Bartonia</i> (f)	<i>Gomphrena</i> (f)
<i>Begonia</i> (f)	<i>Gypsophila</i> (a and p)
<i>Bellis perennis</i> (English daisy) (f)	<i>Helenium autumnale</i> (sneezeweed) (f)
<i>Calendula</i> (pot marigold) (f)	<i>Helicrysum</i> (straw flower) (f)
<i>Callistephus</i> (China aster) (f)	<i>Helipterum</i> (<i>Rhodanthe</i>) <i>manglesi</i> (f), <i>H. (Acroclinium) roseum</i> (f)
<i>Calonyction</i> (moonflower) (f)	<i>Humulus</i> (hop vine) (f)
<i>Campanula</i> (Canterbury bell) (f)	<i>Hunnemannia</i>
<i>Canna</i> (f)	<i>Iberis</i> (candytuft) (f)
<i>Celosia</i> (cockscomb or other species) (f)	<i>Impatiens balsamina</i> (balsam) (f)
<i>Centaurea</i> (corn flower and other species) (a; f)	<i>Ipomea purpurea</i> (morning-glory) (f)
<i>Chrysanthemum maximum</i> (Shasta daisy) (f; p), <i>C. coccineum</i> (pyrethrum) (f; p), <i>C. parthenium</i> (feverfew or matricaria) (f; p)	<i>Kochia</i> (summer cypress) (f)
<i>Cheiranthus</i> (wallflower) (f)	<i>Lathyrus odorata</i> (sweet pea)
<i>Cineraria</i> (f)	<i>Lavandula</i> (lavender) (f)
<i>Cistus</i> (rock rose) (f)	<i>Linaria maroccana</i> (a)
<i>Clarkia</i>	<i>Linum</i> (flax) (a)
<i>Clematis</i> (f)	<i>Lobelia</i> (f)
<i>Coreopsis grandiflora</i> (coreopsis) (p; f)	<i>Lobularia maritima</i> (sweet alyssum)
<i>Cosmos</i> (f)	<i>Lupinus</i> (lupin) (f)
<i>Cotoneaster</i> (f)	<i>Lychnis viscaria</i> (viscaria)
<i>Cyclamen</i> (f)	<i>Malcomia maritima</i> (Virginian stocks)
<i>Dahlia</i> (f)	<i>Mathiola incana</i> var. <i>annua</i> (ten-weeks stock)
<i>Delphinium</i> hybrids (f)	<i>Maurandia</i>
<i>Dianthus plumarius</i> (pink), <i>D. caryophyllus</i> (carnation), and <i>D. barbatus</i> (sweet william) (f)	<i>Mimulus moschatus</i> (musk plant) (a; f)
<i>Digitalis</i> (foxglove) (f)	<i>Myosotis</i> (forget-me-not) (f)
	<i>Nemesia</i> (f)

* a-annual species; p-perennial species; f-plant in flat.

SEEDS—Continued

<i>Nemophila</i> (baby blue-eyes)	<i>Salvia</i> (flowering sage) (f)
<i>Nigella damascena</i> (love-in-a-mist)	<i>Scabiosa atropurpurea</i> (mourning
(f)	bride) (a; f), <i>S. caucasica</i> (blue
<i>Papaver nudicaule</i> (Iceland poppy)	bonnet) (p; f), and <i>S. columbaria</i>
(p; f), <i>P. rheas</i> (shirley poppy)	(p; f)
(a), and <i>P. orientale</i> (Oriental	<i>Schizanthus</i> (butterfly flower) (f)
poppy) (p; f)	<i>Statice</i> (f)
<i>Pentstemon</i> (f)	<i>Tagetes</i> (African and French mari-
<i>Petunia</i> (f)	golds) (f)
<i>Phlox drummondii</i> (a; f)	<i>Thunbergia</i> (f)
<i>Portulaca</i> (f)	<i>Trachymene</i> (blue lace-flower) (f)
<i>Primula</i> (primrose) (f)	<i>Tropeolum majus</i> (nasturtium)
<i>Pueraria</i> (kudzu vine) (f)	<i>Verbena</i> (f)
<i>Pyracantha</i> (firethorn) (f)	<i>Viola cornuta</i> (tufted pansy) and <i>V.</i>
<i>Quamoclit lobata</i> (f)	<i>tricolor</i> var. <i>hortensis</i> (pansy)
<i>Reseda</i> (mignonette)	(p; f)
<i>Rudbeckia</i> (cone flower) (f)	<i>Zinnia</i> (f)
<i>Salpiglossis</i> (f)	

BULBS AND ROOTS

<i>Agapanthus</i>	<i>Leucojum</i> (snowflake)
<i>Alstroemeria</i> (Peruvian lily)	<i>Lilium regale</i> (regal lily) and other
<i>Amaryllis belladonna</i>	hardy species
<i>Anemone</i>	<i>Narcissus pseudo-narcissus</i> (daffodil),
<i>Astilbe</i> (herbaceous spirea)	<i>N. poeticus</i> , and other late species
<i>Begonia</i> ; tuberous-rooted	<i>Nymphaea</i> (hardy water lily)
<i>Boussingaultia</i> (Madeira vine)	<i>Pconia</i> (peony)
<i>Canna</i>	<i>Platycodon</i> (balloon flower)
<i>Convallaria</i> (lily-of-the-valley)	<i>Polianthes</i> (tuberose)
<i>Crocus</i>	<i>Ranunculus</i>
<i>Cyclamen</i>	<i>Sparaxis tricolor</i>
<i>Dicentra</i> (bleeding heart)	<i>Tigridia</i> (tiger flower)
<i>Discoria batatas</i> (cinnamon vine)	<i>Tritonia hybrid</i> (montbretia)
<i>Freesia</i>	<i>Tulipa</i> (tulip)
<i>Galanthus</i> (snowdrop)	<i>Watsonia</i>
<i>Gladiolus</i>	<i>Zantedeschia</i> (calla)
<i>Gloxinia</i>	<i>Zephyranthes</i> (zephyr lily)

TRANSPLANTING

<i>Antirrhinum</i> (snapdragon)	<i>Heuchera</i> (coral bells)
<i>Aquilegia</i> (columbine)	<i>Mathiola incana</i> (stock)
<i>Calceolaria</i> ; shrubby species	<i>Pentstemon</i>
<i>Campanula medium</i> (Canterbury	<i>Petunia</i>
bell)	<i>Phlox</i> (p)
<i>Chrysanthemum coccineum</i> (pyre-	<i>Primula</i> (primrose)
thrum), <i>C. maximum</i> (Shasta daisy)	<i>Rosa</i> (rose)
Deciduous shrubs and trees, or vines	<i>Salpiglossis</i>
<i>Delphinium</i>	<i>Scabiosa caucasica</i> (blue bonnet) and
<i>Digitalis</i> (foxglove)	<i>S. columbaria</i>
Evergreen shrubs and trees, or vines;	<i>Verbena</i>
hardy species	<i>Viola tricolor</i> var. <i>hortensis</i> (pansy)

MARCH

SEEDS

- Abronia* (sand verbenae)
Abutilon hybrids
Ageratum (floss flower) (f)*
Althea rosea (hollyhock)
Anchusa (f)
Antirrhinum (snapdragon)
Aquilegia (columbine) (f)
Arctotis (African blue daisy)
Aubretia
Bartonia
Begonia (f)
Bellis perennis (English daisy) (f)
Brachycome
Calendula (pot marigold)
Callistephus (China aster) (f)
Calonyction (moonflower) (f)
Campanula (f)
Canna (f)
Celosia (cockscorn and other species) (f)
Centaurea cyanus (cornflower) (a)
 and *C. moschata* (sweet sultan) (a; f)
Cercis (red bud) (f)
Cheiranthus (wallflower) (f)
Chrysanthemum coccineum (pyrethrum) (p; f), *C. maximum* (Shasta daisy) (p; f) and *C. parthenium* (feverfew) (p; f)
Cineraria
Cistus (rock rose) (f)
Clarkia
Clematis (f)
Cobea
Coreopsis tinctoria (calliopsis) (a),
 C. lanceolata and *C. grandiflora* (coreopsis) (p)
Cosmos (f)
Cotoneaster (f)
Cyclamen (f)
Dahlia
Delphinium ajacis (larkspur) (a)
Dianthus plumarius (spice pink) (p; f), *D. caryophyllus* (carnation) (p; f) and *D. barbatus* (sweet william) (p; f)
Digitalis (foxglove)
Dimorphotheca (f)
Dolichis lignosus (Australian pea)
Eschscholtzia (California poppy)
Gaillardia pulchella (a) and *G. aristata* (p; f)
- Gerbera jamesoni* (Transvaal daisy) (f)
Geum (f)
Gilia
Gloxinia (f)
Godetia
Gomphrena (globe amaranth)
Gypsophila elegans (a) and *G. paniculata* (baby's breath) (p; f)
Helenium (sneezeweed)
Helianthus (sunflower)
Helichrysum (strawflower)
Heliopsis
Helipterum (*Rhodanthe*) *manglesi* and *H. (Acroclinium) roseum*
Iberis (candytuft) (a)
Impatiens balsamina (balsam) (f)
Ipomea purpurea (morning-glory) (a)
Kochia (summer cypress) (f)
Lathyrus odorata (sweet pea)
Lavatera (tree mallow) (p)
Lavandula (lavender) (f)
Linaria maroccana (a)
Linum (flax) (a)
Lobelia (f)
Lobularia maritima (sweet alyssum)
Lunaria (honesty plant) (f)
Lupinus (lupin) (f)
Lychnis viscaria (viscaria)
Malcomia maritima (Virginian stock)
Mathiola incana var. *annua* (ten-weeks stock) (f)
Maurandia
Mimulus moschatus (musk plant) (a; f)
Myosotis (forget-me-not)
Nemesia (f)
Nemophila (baby blue-eyes)
Nicotiana (flowering tobacco) (f)
Nigella damascena (love-in-a-mist)
Papaver nudicaule (Iceland poppy) (p; f), *P. orientale* (Oriental poppy) (p; f), and *P. rheas* (shirley poppy) (a)
Pentstemon
Petunia (f)
Phlox drummondii (a; f)
Portulaca
Primula polyantha, *P. veris*, and *P. elatior* (primrose) (p; f)
Pueraria (kudzu vine)

* a—annual species; p—perennial species; f—plant in flat.

SEEDS—Continued

<i>Pyracantha</i> (firethorn) (f)	<i>Tagetes</i> (French and African marigold)
<i>Quamoclit lobata</i> (f)	<i>Thalictrum</i> (meadow rue) (f)
<i>Reseda odorata</i> (mignonette)	<i>Thunbergia</i> (f)
<i>Rudbeckia</i> (coneflower) (a and p)	<i>Trachymene</i> (blue lace-flower or didiscus) (f)
<i>Salpiglossis</i> (f)	<i>Tropeolum majus</i> (nasturtium)
<i>Salvia</i> (flowering sage) (f)	<i>Verbena</i> (f)
<i>Scabiosa atropurpurea</i> (mourning bride) (a), <i>S. caucasica</i> (blue bonnet) (p; f) and <i>S. columbaria</i> (p; f)	<i>Viola cornuta</i> (tufted pansy) and <i>P. tricolor</i> var. <i>hortensis</i> (pansy) (p; f)
<i>Schizanthus</i> (butterfly flower) (f)	<i>Zinnia</i> (f)
<i>Statice</i> (f)	

BULBS AND ROOTS

<i>Agapanthus</i>	<i>Galanthus</i> (snowdrop)
<i>Amaryllis</i>	<i>Gladiolus</i>
<i>Antigonon</i> (rosa de montana)	<i>Gloxinia</i>
<i>Astilbe</i> (herbaceous spirea)	<i>Leucojum</i> (snowflake)
<i>Begonia</i> ; tuberous-rooted	<i>Nymphaea</i> (hardy water lily)
<i>Boussingaultia</i> (Madeira vine)	<i>Peonia</i> (peony)
<i>Canna</i>	<i>Polianthes</i> (tuberose)
<i>Convallaria</i> (lily-of-the-valley)	<i>Tigridia</i> (tiger flower)
<i>Cyclamen</i>	<i>Tritonia</i> hybrid (montbretia)
<i>Dahlia</i>	<i>Watsonia</i>
<i>Dicentra</i> (bleeding heart)	<i>Zantedeschia</i> (calla)
<i>Discoria batatas</i> (cinnamon vine)	<i>Zephyranthes</i> (zephyr lily)
<i>Freesia</i>	

TRANSPLANTING

<i>Begonia</i>	<i>Gerbera</i> (Transvaal daisy)
<i>Calceolaria</i>	<i>Geum</i>
<i>Callistephus</i> (China aster)	<i>Heuchera</i>
<i>Celosia</i> (cockscomb and other species)	<i>Kochia</i>
<i>Centaurea</i>	<i>Papaver nudicaule</i> (Iceland poppy) and <i>P. orientale</i> (Oriental poppy)
<i>Chrysanthemum coccineum</i> (pyrethrum), <i>C. maximum</i> (Shasta daisy)	Rock plants
<i>Coreopsis tinctoria</i> (calliopsis), <i>C. lanceolata</i> , and <i>C. grandiflora</i> (coreopsis)	<i>Rosa</i> (rose)
Deciduous trees and shrubs, or vines	<i>Salpiglossis</i>
<i>Delphinium</i> hybrids (perennial larkspur)	<i>Salvia</i> (flowering sage)
Evergreen shrubs and trees, or vines; hardy species	<i>Scabiosa caucasica</i> (blue bonnet) and <i>S. columbaria</i>
	<i>Verbena</i>

APRIL

SEEDS

- Abronia* (sand verbena)
Abutilon
Ageratum (floss flower)
Althea rosea (hollyhock)
Amaranthus (f)*
Anchusa (f)
Anemone coronaria (p; f)
Antirrhinum (snapdragon) (f)
Arctotis (African blue daisy)
Aubretia
Bartonia
Bellis perennis (English daisy)
Calendula (pot marigold)
Callistephus (China aster) (f)
Calonyction (moonflower) (f)
Campanula (f)
Canna (f)
Cardiospermum halicacabum (balloon vine)
Celosia (cockscorn and other species) (f)
Celsia cretica (f)
Centaurea cyanus (cornflower) and *C. moschata* (sweet sultan) (a; f)
Cheiranthus (wallflower) (f)
Chrysanthemum coccineum (pyrethrum) (p; f), *C. maximum* (Shasta daisy) (p; f), *C. parthenium* (feverfew) (p; f), and *C. morifolium* (florists' chrysanthemum) (p; f)
Cineraria (f)
Clarkia
Clematis (f)
Cobea; place in 3-inch pots
Coreopsis tinctoria (calliopsis) (a), *C. lanceolata*, and *C. grandiflora* (coreopsis) (p)
Cosmos (f)
Dahlia (f)
Delphinium hybrids (p; f)
Dianthus plumarius (pink) (p; f), *D. caryophyllus* (carnation) (p; f), and *D. barbatus* (sweet william) (p; f)
Digitalis (foxglove) (f)
Dimorphotheca (f)
Dolichos lignosus (Australian pea)
Eschscholtzia (California poppy)
Gaillardia pulchella (a) and *G. aristata* (p; f)
Gerbera (Transvaal daisy) (f)
Geum (f)
Gilia
Gladiolus
Godetia
Gomphrena (globe amaranth) (f)
Gypsophila (baby's breath) (a; p)
Helcnum (sneezeweed)
Helianthus (sunflower)
Helichrysum (strawflower)
Heliothis
Helipterum (Rhodanthe) manglesi (f), *H. (Acroclinium) roscum* (f)
Humulus (hop vine)
Hunnemannia
Iberis (candytuft) (a)
Impatiens balsamina (balsam) (a)
Ipomoea purpurea (morning-glory) (a)
Kochia (summer cypress) (f)
Lagenaria (ornamental gourd)
Lathyrus odorata (sweet pea)
Lavatera (tree mallow) (p)
Linaria maroccana (a)
Linum (flax)
Lobelia (f)
Lupinus (lupin) (f)
Lychnis viscaria (viscaria) (f)
Malcomia maritima (Virginian stocks)
Malope
Mathiola incana var. *annua* (ten-weeks stock)
Nemesia
Nemophila (baby blue-eyes)
Nicotiana (flowering tobacco) (f)
Nigella damascena (love-in-a-mist)
Oenothera (evening primrose)
Papaver nudicaule (Iceland poppy) (p; f), *P. rhoeas* (shirley poppy) (a), and *P. orientale* (Oriental poppy) (p; f)
Petunia (f)
Phlox drummondii (annual phlox)
Portulaca
Primula (primrose) (f)
Pueraria (kudzu vine) (f)
Quamoclit sloteri (cardinal climber) (a), *Q. pennata* (cypress vine) (a), and *Q. lobata* (p; f)
Rudbeckia (coneflower)
Salpiglossis (f)

* a—annual species; p—perennial species; f—plant in flat.

SEEDS—Continued

<i>Salvia</i> (flowering sage) (f)	<i>Thunbergia</i>
<i>Scabiosa atropurpurea</i> (mourning bride) (a), <i>S. caucasica</i> (blue bon- net) (p; f), and <i>S. columbaria</i> (p; f)	<i>Tithonia</i> (f)
<i>Schizanthus</i> (butterfly flower) (f)	<i>Trachymene</i> (blue lace-flower) (f)
<i>Statice</i> (f)	<i>Tropeolum majus</i> (nasturtium)
<i>Tagetes</i> (African and French mari- golds)	<i>Valeriana</i> (valerian) (p; f)
<i>Thalictrum</i> (meadow rue) (f)	<i>Verbena</i> (f)
	<i>Viola cornuta</i> (tufted pansy) and <i>V.</i> <i>tricolor</i> var. <i>hortensis</i> (pansy) (p; f)
	<i>Zinnia</i> (f)

BULBS AND ROOTS

<i>Agapanthus</i>	<i>Freesia</i>
<i>Begonia</i> ; tuberous-rooted	<i>Gladiolus</i>
<i>Boussingaultia</i> (Madeira vine)	<i>Gloxinia</i>
<i>Canna</i>	<i>Nymphaea</i> (hardy water lily)
<i>Dahlia</i>	<i>Pconia</i> (peony)
<i>Dicentra</i> (bleeding heart)	<i>Polianthes</i> (tuberose)
<i>Dioscorea batatas</i> (cinnamon vine)	<i>Watsonia</i>

TRANSPLANTING

<i>Antirrhinum</i> (snapdragon)	<i>Cecum</i>
<i>Aquilegia</i> (columbine)	<i>Kochia scoparia</i> (summer cypress)
<i>Begonia</i> ; tuberous-rooted and fibrous- rooted	<i>Mathiola incana</i> var. <i>annua</i> (ten- weeks stock)
<i>Calceolaria</i>	<i>Papaver nudicaule</i> (Iceland poppy)
<i>Callistephus</i> (China aster)	<i>Pentstemon</i>
<i>Celosia</i> (cocksecomb and other species)	<i>Petunia</i>
<i>Centaurea</i>	<i>Phlox</i>
<i>Chrysanthemum coccineum</i> (pyre- thrum) <i>C. maximum</i> (Shasta daisy), <i>C. morifolium</i> (florists' chrysanthemum)	Rock plants
<i>Cineraria</i>	<i>Salpiglossis</i>
<i>Coreopsis grandiflora</i> (coreopsis)	<i>Salvia</i> (flowering sage)
<i>Cosmos</i>	<i>Scabiosa caucasica</i> (blue bonnet) and <i>S. columbaria</i>
<i>Delphinium</i> hybrid	<i>Statice</i>
<i>Dianthus caryophyllus</i> (carnation) and <i>D. barbatus</i> (sweet william)	<i>Tagetes</i> (African and French mari- golds)
<i>Digitalis</i>	<i>Verbena</i>
<i>Gaillardia aristata</i>	<i>Viola cornuta</i> (tufted pansy) and <i>V.</i> <i>tricolor</i> var. <i>hortensis</i> (pansy)
<i>Gerbera</i> (Transvaal daisy)	<i>Zinnia</i>

MAY

SEEDS

- Abutilon*
Abronia (sand verbenia)
Agcratum (floss flower)
Althea rosea (hollyhoek)
Amaranthus
Anemone (f)*
Arctotis (African blue daisy)
Bellis perennis (English daisy)
Callistephus (China aster) (f)
Calonyction (moonflower) (f)
Celosia (cockscorn and other species) (f)
Centaurea (cornflower and sweet sultan) (f)
Cincrarla (f)
Chrysanthemum coccineum (pyrethrum) (p)
Clarkia
Cobea; plant in 3-inch pots
Coreopsis tinctoria (calliopsis) (a), *C. lanceolata* (p), and *C. grandiflora* (coreopsis) (p)
Cosmos (f)
Dahlia (f)
Delphinium hybrids (p; f)
Dianthus plumarius (pink), *D. caryophyllus* (carnation) (p; f)
Dimorphotheca (f)
Eschscholtzia (California poppy)
Gaillardia pulchella (a), and *G. aristata* (p; f)
Gerbera (Transvaal daisy) (f)
Geum (f)
Gilia
Godetia
Gomphrena (globe amaranth) (f)
Gypsophila (baby's breath) (a)
Helenium (sneezeweed)
Helianthus (sunflower)
Helichrysum (strawflower)
Heliopsis
Helipterum (*Acroclinium*) *roseum* (f)
Humulus (hop vine)
- Hunnemannia*
Iberis (candytuft)
Impatiens balsamina (balsam)
Ipomoea purpurea (morning-glory)
Kochia scoparia (summer cypress) (f)
Lagenaria (ornamental gourd)
Lathyrus odorata (sweet pea)
Lavatera (tree mallow) (p)
Lavandula (lavender) (f)
Linaria maroccana (f)
Linum (flax) (a)
Lobelia (f)
Lobularia maritima (sweet alyssum)
Lupinus (lupin) (f)
Lychnis viscaria (viscaria) (f)
Malope
Mathiola incana var. *annua* (ten-weeks stock) and other forms
Maurandia
Myosotis (forget-me-not)
Nemesia
Nemophila (baby blue-eyes)
Nicotiana (flowering tobacco)
Nigella damascena (love-in-a-mist)
Papaver nudicaule (Iceland poppy)
Petunia (f)
Phlox (a)
Portulaca
Primula (primrose) (f)
Quamoclit pennata (cypress vine) and *Q. lobata*
Rudbeckia (coneflower) (a and p)
Salpiglossis
Salvia (flowering sage) (f)
Scabiosa atropurpurea (mourning bride) (a)
Schizanthus (butterfly flower) (f)
Statice (f)
Tagetes (African and French marigolds)
Thunbergia
Viola cornuta (tufted pansy) (f)
Zinnia

BULBS AND ROOTS

- Begonia*; tuberous-rooted
Boussingaultia (Madeira vine)
Canna
Dahlia
Dioscorea batatas (cinnamon vine)
Gladiolus
- Gloxinia*
Nymphaea (water lily)
Peonia (peony)
Polianthes (tuberose)
Watsonia

* a—annual species; p—perennial species; f—plant in flat.

TRANSPLANTING

<i>Althea rosea</i> (hollyhock)	<i>Gaillardia aristata</i>
<i>Antirrhinum</i> (snapdragon)	<i>Gerbera</i> (Transvaal daisy)
<i>Begonia</i> ; tuberous-rooted and fibrous-rooted	<i>Impatiens balsamina</i> (balsam)
<i>Bellis perennis</i> (English daisy)	<i>Kochia scoparia</i> (summer cypress)
<i>Callistephus</i> (China aster)	<i>Myosotis</i> (forget-me-not)
<i>Centaurea</i> (cornflower and sweet sul-tan)	<i>Papaver nudicaule</i> (Iceland poppy)
<i>Chrysanthemum morifolium</i> (florists' chrysanthemum)	<i>Pentstemon</i>
<i>Coreopsis grandiflora</i> (coreopsis)	<i>Petunia</i>
<i>Delphinium</i> hybrids	Rock plants
<i>Dianthus caryophyllus</i> (carnation)	<i>Salvia</i> (flowering sage)
and <i>D. barbatus</i> (sweet william)	<i>Tagetes</i> (African and French mari-golds)
	<i>Verbena</i>
	<i>Zinnia</i>

JUNE

SEEDS

<i>Bellis perennis</i> (English daisy) (f)*	<i>Iberis</i> (candytuft)
<i>Calendula</i> (pot marigold)	<i>Lathyrus odorata</i> (sweet pea)
<i>Celosia</i> (cockscorn and other species) (f)	<i>Lavatera</i> (tree mallow)
<i>Centaurea</i> (cornflower and sweet sul-tan) (f)	<i>Linaria maroccana</i> (a)
<i>Chrysanthemum morifolium</i> (florists' chrysanthemum) (f)	<i>Linum</i> (flax) (a)
<i>Cineraria</i> (f)	<i>Lychnis viscaria</i> (viscaria)
<i>Coreopsis grandiflora</i> (coreopsis)	<i>Mathiola incana</i> (stock)
<i>Cosmos</i>	<i>Myosotis</i> (forget-me-not)
<i>Delphinium</i> hybrid (f)	<i>Petunia</i> (f)
<i>Dianthus barbatus</i> (sweet william) (f)	<i>Phlox</i> (a)
<i>Digitalis</i> (foxglove) (f)	<i>Papaver nudicaule</i> (Iceland poppy) (f)
<i>Gaillardia aristata</i>	<i>Portulaca</i>
<i>Gilia</i>	<i>Salpiglossis</i> (f)
<i>Gladiolus</i> ; shade the bed	<i>Tagetes</i> (African and French mari-golds)
<i>Godetia</i>	<i>Tropeolum majus</i> (nasturtium)
<i>Gypsophila</i> (baby's breath) (a)	<i>Viola cornuta</i> (tufted pansy) (f)
	<i>Zinnia</i>

BULBS AND ROOTS

<i>Boussingaultia</i> (Madeira vine)	<i>Gladiolus</i>
<i>Canna</i>	<i>Iris germanica</i> (German iris)
<i>Dahlia</i>	<i>Polianthes</i> (tuberose)
<i>Dioscorea batatas</i> (cinnamon vine)	

* a—annual species; p—perennial species; f—plant in flat.

TRANSPLANTING

<i>Ageratum</i> (floss flower)	<i>Dianthus caryophyllus</i> (carnation)
<i>Antirrhinum</i> (snapdragon)	<i>Impatiens balsamina</i> (balsam)
<i>Begonia</i> ; tuberous-rooted and fibrous-rooted	<i>Mathiola incana</i> (stock)
<i>Bellis perennis</i> (English daisy)	<i>Pentstemon</i>
<i>Callistephus</i> (China aster)	<i>Petunia</i>
<i>Celosia</i> (cockscomb and other species)	<i>Salvia</i> (flowering sage)
<i>Centaurea</i> (cornflower and sweet sultan)	<i>Tagetes</i> (African and French marigolds)
<i>Coreopsis grandiflora</i> (coreopsis)	<i>Viola odorata</i> (violet) and <i>V. cornuta</i> (tufted pansy)
<i>Cosmos</i>	<i>Zinnia</i>

JULY

SEEDS

<i>Antirrhinum</i> (snapdragon) (f)*	<i>Mathiola incana</i> (stock)
<i>Bellis perennis</i> (English daisy) (f)	<i>Phlox</i>
<i>Calceolaria</i> (f)	<i>Portulaca</i>
<i>Calendula</i> (pot marigold)	<i>Primula polyantha</i> (polyanthus)
<i>Campanula medium</i> (Canterbury bells) (f)	primrose (f)
<i>Centaurea</i> (cornflower and sweet sultan)	<i>Salpiglossis</i> (f)
<i>Cineraria</i> (f)	<i>Schizanthus</i> (butterfly flower) (f)
<i>Cosmos</i>	<i>Tagetes</i> (African and French marigolds)
<i>Delphinium</i> hybrid (f)	<i>Tropeolum majus</i> (nasturtium)
<i>Iberis</i> (candytuft)	<i>Viola cornuta</i> (tufted pansy) and <i>V. tricolor</i> var. <i>hortensis</i> (pansy) (f)
<i>Lobelia</i> (f)	<i>Zinnia</i>

BULBS AND ROOTS

Iris germanica (German iris)

TRANSPLANTING

<i>Bellis perennis</i> (English daisy)	<i>Myosotis</i> (forget-me-not)
<i>Centaurea moschata</i> (sweet sultan)	<i>Petunia</i>
<i>Coreopsis grandiflora</i> (coreopsis)	<i>Phlox</i>
<i>Cosmos</i>	<i>Salpiglossis</i>
<i>Dianthus caryophyllus</i> (carnation)	<i>Scabiosa columbaria</i>
<i>Digitalis</i> (foxglove)	<i>Tagetes</i> (African and French marigolds)
<i>Gaillardia aristata</i>	<i>Viola odorata</i> (violet)
<i>Iberis</i> (candytuft)	

* a—annual species; p—perennial species; f—plant in flat.

AUGUST

SEEDS

<i>Acacia</i> (f)*	<i>Gypsophila</i> (baby's breath) (a)
<i>Achillea</i> (f)	<i>Helanium</i> (f)
<i>Althea rosea</i> (hollyhock)	<i>Heliopsis</i>
<i>Anchusa</i> (f)	<i>Lathyrus odorata</i> (sweet pea)
<i>Antirrhinum</i> (snapdragon) (f)	<i>Lavandula</i> (lavender) (f)
<i>Aquilegia</i> (columbine) (f)	<i>Lobelia</i> (f)
<i>Aster novi-belgi</i> (New York aster or michaelmas daisy) (f)	<i>Lunaria</i> (honesty plant) (f)
<i>Begonia</i> (f)	<i>Mathiola incana</i> (stock) (f)
<i>Browallia</i> (f)	<i>Myosotis</i> (forget-me-not) (f)
<i>Calceolaria</i> (f)	<i>Pentstemon</i> (f)
<i>Calendula</i> (pot marigold)	<i>Petunia</i> (f)
<i>Campanula</i> (Canterbury bells) (f)	<i>Phlox</i> (f)
<i>Ceanothus</i> (wild lilac) (f)	<i>Physostegia</i> (false dragonhead) (f)
<i>Centaurea</i> (corn flower) (a)	<i>Papaver nudicaule</i> (Iceland poppy)
<i>Cheiranthus</i> (wallflower) (f)	(p; f), and <i>P. orientale</i> (Oriental poppy) (p; f)
<i>Chrysanthemum coccineum</i> (pyre- thrum) (f)	<i>Primula</i> (primrose) (f)
<i>Cineraria</i> (f)	<i>Salpiglossis</i> (f)
<i>Coreopsis grandiflora</i> (coreopsis) (f)	<i>Scabiosa caucasica</i> (blue bonnet)
<i>Cyclamen</i> (f)	(p; f), and <i>S. columbaria</i> (p; f)
<i>Delphinium hybrid</i> (f)	<i>Schizanthus</i> (butterfly flower) (f)
<i>Dianthus caryophyllus</i> (carnation)	<i>Tagetes</i> (African and French mari- golds) (f)
(f)	<i>Tropeolum majus</i> (nasturtium)
<i>Digitalis</i> (foxglove) (f)	<i>Verbena</i> (f)
<i>Dolichos lignosus</i> (Australian pea)	<i>Viola cornuta</i> (tufted pansy) and <i>V.</i> <i>tricolor</i> var. <i>hortensis</i> (pansy)
<i>Gaillardia aristata</i> (p; f)	(p; f)
<i>Gerbera</i> (f)	
<i>Geum</i> (f)	

BULBS AND ROOTS

<i>Cyclamen</i>	<i>Ornithogalum</i>
<i>Freesia</i>	<i>Oxalis</i>
<i>Iris germanica</i> (German iris)	<i>Ranunculus</i>
<i>Lapeirousia cruenta</i> (flame freesia)	<i>Zantedeschia</i> (calla)
<i>Lilium longiflorum</i> (Easter lily)	

TRANSPLANTING

<i>Bellis perennis</i> (English daisy)	<i>Iberis</i> (candytuft)
<i>Centaurea</i> (sweet sultan)	<i>Phlox</i>
<i>Cineraria</i>	<i>Petunia</i>
<i>Coreopsis grandiflora</i> (coreopsis)	<i>Salpiglossis</i>
<i>Cosmos</i>	<i>Tagetes</i> (African and French mari- golds)
<i>Dianthus caryophyllus</i> (carnation)	<i>Viola odorata</i> (violet) and <i>V. tricolor</i>
<i>Digitalis</i> (foxglove)	(pansy)
<i>Gaillardia aristata</i>	

* a—annual species; p—perennial species; f—plant in flat.

SEPTEMBER

SEEDS

- Abronia* (sand verbena) (f)*
Abutilon (f)
Achillea (f)
Althea rosea (hollyhock) (f)
Anchusa (f)
Antirrhinum (snapdragon) (f)
Aquilegia (columbine) (f)
Arctotis (African blue daisy) (f)
Aster (michaelmas daisy) (f)
Bartonia (f)
Bellis perennis (English daisy) (f)
Calendula (pot marigold) (f)
Campanula medium (Canterbury bells) (f)
Ceanothus (wild lilac) (f)
Centaurea (sweet sultan) (f)
Cheiranthus (wallflower) (f)
Chrysanthemum parthenium (feverfew) (p; f), and *C. coccineum* (pyrethrum) (p; f)
Cineraria (f)
Clarkia
Clematis (f)
Coreopsis grandiflora (coreopsis) (p; f)
Cyclamen (f)
Delphinium hybrid (f)
Dianthus caryophyllus (carnation) (f) and *D. barbatus* (sweet william) (f)
Digitalis (foxglove) (f)
Dimorphotheca (f)
Dolichos lignosus (Australian pea)
Eschscholtzia (California poppy)
Gaillardia aristata (p; f)
Gerbera (Transvaal daisy) (f)
Geum (f)
Gilia
Godetia
Gypsophila (baby's breath) (p; f)
Helenium (sneezeweed)
Heliosis
Lathyrus odorata (sweet pea)
Lavandula (lavender) (f)
Linum (flax) (f)
Lupinus (lupin)
Lunaria (honesty plant) (f)
Mathiola incana (stock) (f)
Mimulus moschatus (musk plant) (a; f)
Myosotis (forget-me-not) (f)
Nemesia
Nemophila (baby blue-eyes)
Papaver nudicaule (Iceland poppy) (p; f) and *P. orientale* (Oriental poppy) (p; f)
Pentstemon (f)
Petunia (f)
Phlox drummondii (a)
Primula malacoides (fairy primrose), *P. veris* (cowslip), *P. elatior* (oxslip), and *P. polyantha* (polyanthus primrose) (f)
Pueraria (kudzu vine) (f)
Salpiglossis (f)
Scabiosa atropurpurea (mourning bride) (a; f), *S. caucasica* (blue bonnet) (p; f), and *S. columbaria* (p; f)
Schizanthus (butterfly flower) (f)
Statice (f)
Tagetes (African and French marigolds) (f)
Verbena (f)
Viola cornuta (tufted pansy) (f) and *V. tricolor* var. *hortensis* (pansy) (f)

BULBS AND ROOTS

- Allium*
Amaryllis
Anemone
Bloomeria
Brodiaea
Calochortus (Mariposa lily)
Crocus
Cyclamen
Freesia
Galanthus (snowdrop)
Gladiolus; early
Iris; all species
Ixia
Lachenalia (Cape cowslip)
Lapeirousia cruenta (flame freesia)
Leucojum (snowflake)
Lilium (lily); most species
Narcissus pseudo-narcissus (daffodil), *N. jonquilla* (jonquil), and other species
Ornithogalum
Oxalis
Ranunculus
Scilla
Tulipa (tulip)
Watsonia
Zantedeschia (calla)

* a—annual species; p—perennial species; f—plant in flat.

TRANSPLANTING

Antirrhinum (snapdragon)
Campanula medium (Canterbury
 bells)
Centaurea
Cineraria
Cosmos

Eremurus
Lobelia
Mathiola incana (stock)
Viola odorata (violet) and *V. tricolor*
 (pansy)

OCTOBER

SEEDS

Abronia (sand verbena) (f)*
Abutilon (f)
Achillea (f)
Althea rosea (hollyhock) (f)
Anchusa (f)
Antirrhinum (snapdragon) (f)
Aquilegia (columbine) (f)
Arctotis (African blue daisy) (f)
Bartonia (f)
Begonia (f)
Bellis perennis (English daisy) (f)
Calceolaria; hothouse species (f)
Calendula (pot marigold) (f)
Campanula medium (Canterbury
 bells) (f)
Centaurea (sweet sultan) (f)
Cheiranthus (wallflower) (f)
Chrysanthemum coccineum (pyre-
 thrum) (f) and *C. maximum*
Cineraria (f)
Clarkia
Clematis (f)
Coreopsis grandiflora (coreopsis) (f)
Cyclamen (f)
Delphinium hybrid and *D. ajacis*
 (larkspur) (f)
Dianthus caryophyllus (carnation)
 (f) and *D. barbatus* (sweet
 william) (f)
Digitalis (foxglove) (f)
Dimorphotheca (f)
Dolichos lignosus (Australian pea)
Eschscholtzia (California poppy)
Gaillardia aristata (p; f)
Gerbera (Transvaal daisy) (f)
Geum (f)
Gilia
Godetia
Gypsophila (baby's breath) (p; f)
Helenium (sneezeweed)
Heliopsis
Helipterum (*Acroclinium*) *roseum*
 (f)

Iberis amara (candytuft); in warm
 districts
Lathyrus odorata (sweet pea)
Lavandula (lavender) (f)
Linum (flax) (f)
Lobularia maritima (sweet alyssum)
Lunaria (honesty plant) (f)
Lupinus (lupin)
Lychnis chalconica (maltese cross)
 (p; f)
Malcolmia maritima (Virginian
 stock)
Mathiola incana (stock) (f)
Minulus moschatus (musk plant)
 (a; f)
Myosotis (forget-me-not) (f)
Nemesia
Nemophila (baby blue-eyes)
Nigella damascena (love-in-a-mist)
Papaver nudicaule (Iceland poppy)
 (p; f), *P. orientale* (Oriental
 poppy) (p; f)
Primula malacoides (fairy primrose),
P. veris (cowslip), *P. elatior* (ox-
 slip), and *P. polyantha* (poly-
 anthus primrose) (f)
Pueraria (kudzu vine) (f)
Ranunculus
Reseda (mignonette)
Scabiosa atropurpurea (mourning
 bride) (a; f), *S. caucasica* (blue
 bonnet) (p; f), and *S. columbaria*
 (p; f)
Schizanthus (butterfly flower) (f)
Statice (f)
Tagetes (African and French mari-
 golds) (f)
Verbena (f)
Viola cornuta (tufted pansy) (f) and
V. tricolor var. *hortensis* (pansy)
 (f)

* a—annual species; p—perennial species; f—plant in flat.

BULBS AND ROOTS

<i>Aconitum</i> (aconite)	<i>Lapeirousia cruenta</i> (flame freesia)
<i>Agapanthus</i>	<i>Lilium</i> (lily); most species
<i>Amaryllis belladonna</i>	<i>Muscari</i> (grape hyacinth)
<i>Anemone</i>	<i>Narcissus pseudo-narcissus</i> (daffodil),
<i>Bloomeria</i>	<i>N. jonquilla</i> (jonquil), and other
<i>Brodiaea</i>	species
<i>Calochortus</i> (Mariposa lily)	<i>Ornithogalum</i>
<i>Crocus</i>	<i>Oxalis</i>
<i>Cyclamen</i>	<i>Peonia</i> (peony)
<i>Erythronium</i> (dogtooth violet)	<i>Ranunculus</i>
<i>Freesia</i>	<i>Scilla</i>
<i>Galanthus</i> (snowdrop)	<i>Sparaxis</i>
<i>Gladiolus</i> ; early	<i>Tritonia</i> hybrid (montbretia)
<i>Hyacinthus</i> (hyacinth)	<i>Tulipa</i> (tulip)
<i>Iris</i> ; all species	<i>Watsonia</i>
<i>Ixia</i>	<i>Zantedeschia</i> (calla)
<i>Lachenalia</i> (Cape cowslip)	

TRANSPLANTING

<i>Aquilegia</i> (columbine)	<i>Primula malacoides</i> (fairy primrose),
<i>Calendula</i> (pot marigold)	<i>P. veris</i> (cowslip), <i>P. elatior</i> (ox-
<i>Cineraria</i>	slip), and <i>P. polyantha</i> (polyanthus
<i>Dianthus plumarius</i> (pink)	primrose)
<i>Lobelia</i>	<i>Verbena</i>
<i>Mathiola incana</i> (stock)	<i>Viola odorata</i> (violet) and <i>V. tricolor</i>
<i>Petunia</i>	(pansy)

NOVEMBER

SEEDS

<i>Abronia</i> (sand verbena) (f)*	<i>Dianthus caryophyllus</i> (carnation)
<i>Achillea</i> (f)	(f) and <i>D. barbatus</i> (sweet
<i>Althea rosea</i> (hollyhock) (f)	william) (f)
<i>Antirrhinum</i> (snapdragon) (f)	<i>Digitalis</i> (foxglove) (f)
<i>Aquilegia</i> (columbine) (f)	<i>Dimorphotheca</i> (f)
<i>Arctotis</i> (African blue daisy) (f)	<i>Dolichos lignosus</i> (Australian pea)
<i>Bartonia</i> (f)	<i>Eschscholtzia</i> (California poppy)
<i>Bellis perennis</i> (English daisy) (f)	<i>Gaillardia aristata</i> (p; f)
<i>Calendula</i> (pot marigold) (f)	<i>Gerbera</i> (Transvaal daisy) (f)
<i>Campanula medium</i> (Canterbury	<i>Geum</i> (f)
bells) (f)	<i>Gilia</i>
<i>Centaurea</i> (sweet sultan) (f)	<i>Gadetia</i>
<i>Cheiranthus</i> (wallflower) (f)	<i>Gypsophila</i> (baby's breath)
<i>Chrysanthemum coccineum</i> (pyre-	(a and p; f)
thrum) (p; f) and <i>C. maximum</i>	<i>Helenium</i> (sneezeweed)
(Shasta daisy) (p; f)	<i>Heliothis</i>
<i>Clarkia</i>	<i>Helipterum</i> (<i>Acroclinium</i>) <i>roseum</i>
<i>Clematis</i> (f)	<i>Iberis amara</i> (candytuft)
<i>Coreopsis grandiflora</i> (coreopsis) (f)	<i>Lathyrus odorata</i> (sweet pea)
<i>Cyclamen</i> (f)	<i>Lavandula</i> (lavender) (f)
<i>Delphinium</i> hybrid and <i>D. ajacis</i>	<i>Lilium</i> (f)
(larkspur) (f)	<i>Linum</i> (flax) (f)

* a—annual species; p—perennial species; f—plant in flat.

SEEDS—Continued

- Lobularia maritima* (sweet alyssum)
Lunaria (honesty plant) (f)
Lupinus (lupin) (f)
Malcomia maritima (Virginian stock)
Mathiola incana (stock) (f)
Mimulus moschatus (musk plant) (a; f)
Myosotis (forget-me-not) (f)
Nemesia
Nemophila (baby blue-eyes)
Nigella damascena (love-in-the-mist)
Papaver nudicaule (Iceland poppy) (p; f) and *P. orientale* (Oriental poppy) (p; f)
Pentstemon (f)
Petunia (f)
Phlox (f)
- Primula malacoides* (fairy primrose),
P. veris (cowslip), *P. elatior* (ox-slip), and *P. polyantha* (polyanthus primrose) (f)
Pueraria (kudzu vine) (f)
Ranunculus
Reseda (mignonette)
Scabiosa atropurpurea (mourning bride) (a; f), *S. caucasica* (blue bonnet) (p; f), and *S. columbaria* (p; f)
Schizanthus (butterfly flower) (f)
Statice (f)
Tagetes (African and French marigolds) (f)
Verbena hybrida (f)
Viola cornuta (tufted pansy) (f) and *V. tricolor* var. *hortensis* (pansy) (f)

BULBS AND ROOTS

- Aconitum* (aconite)
Agapanthus
Alstroemeria (Peruvian lily)
Amaryllis belladonna
Anemone
Bloomeria
Brodiaea
Calochortus (Mariposa lily)
Crocus
Cyclamen
Dicentra (bleeding heart)
Dierama
Erythronium (dogtooth violet)
Freesia
Fritillaria
Galanthus (snowdrop)
Gladiolus; early
Hyacinthus (hyacinth)
Iris; all species
Ixia
- Lachenalia* (Cape cowslip)
Lapeirousia cruenta (flame freesia)
Leucojum (snowflake)
Lilium (lily); most species
Muscari (grape hyacinth)
Narcissus pseudo-narcissus (daffodil),
N. jonquilla (jonquil), and other species
Ornithogalum
Oxalis
Peonia (peony)
Platycodon (balloon flower)
Ranunculus
Scilla
Sparaxis
Tritonia hybrid (montbretia)
Tulipa (tulip)
Watsonia
Zantedeschia (calla)

TRANSPLANTING

- Antirrhinum* (snapdragon)
Aquilegia (columbine)
Calendula (pot marigold)
Campanula medium (Canterbury bells)
Cineraria
Dianthus caryophyllus (carnation)
Digitalis (foxglove)
Iberis (candytuft)
Mathiola incana (stock)
- Myosotis* (forget-me-not)
Pentstemon
Primula malacoides (fairy primrose),
P. veris (cowslip), *P. elatior* (ox-slip) and *P. polyantha* (polyanthus primrose)
Verbena
Viola odorata (violet) and *V. tricolor* var. *hortensis* (pansy)

DECEMBER

SEEDS

Abronia (sand verbenia) (f)*
Achillea (f)
Antirrhinum (f)
Aquilegia (columbine) (f)
Arctotis (African blue daisy) (f)
Bartonia (f)
Bellis perennis (English daisy) (f)
Calendula (pot marigold) (f)
Campanula medium (Canterbury bells) (f)
Centaurea (sweet sultan) (f)
Cheiranthus (wallflower) (f)
Chrysanthemum coccineum (pyrethrum) (f) and *C. carinatum* (tricolor chrysanthemum) (a)
Clarkia
Clematis (f)
Coreopsis grandiflora (coreopsis) (f) and *C. tinctoria* (calliopsis) (f)
Cyclamen (f)
Delphinium hybrids and *D. ajacis* (larkspur) (f)
Dianthus caryophyllus (carnation) (p; f) and *D. barbatus* (sweet william) (f)
Dolichos lignosus (Australian pea)
Eschscholtzia (California poppy)
Gilia
Godetia
Gypsophila (baby's breath) (a and p; f)

Helenium (sneezeweed)
Helipterum (*Acroclinium*) *roscum* (f)
Iberis (candytuft); warm districts
Lathyrus odorata (sweet pea)
Lobularia maritima (sweet alyssum)
Lunaria (honesty plant) (f)
Lupinus (lupin)
Mathiola incana (stock) (f)
Mimulus moschatus (musk plant) (a; f)
Myosotis (forget-me-not) (f)
Nemesia
Nemophila (baby blue-eyes)
Nigella damascena (love-in-the-mist)
Papaver nudicaule (Iceland poppy) (p; f) and *P. orientale* (Oriental poppy) (p; f)
Pentstemon (f)
Phlox (f)
Pueraria (kudzu vine) (f)
Reseda (mignonette)
Scabiosa atropurpurea (mourning bride) (a; f), *S. caucasica* (blue bonnet) (p; f), and *S. columbaria* (p; f)
Schizanthus (butterfly flower) (f)
Statice
Viola tricolor var. *hortensis* (pansy) (f)

BULBS AND ROOTS

Aconitum (aconite)
Agapanthus
Alstroemeria (Peruvian lily)
Amaryllis belladonna
Anemone
Astilbe (herbaceous spiraea)
Convallaria (lily-of-the-valley)
Crocus
Cyclamen
Dicentra (bleeding heart)
Dierama
Erythronium (dogtooth violet)
Freesia
Fritillaria
Galanthus (snowdrop)
Gladiolus
Gloxinia
Hyacinthus (hyacinth)
Iris; bulbous
Ixia

Leucojum (snowflake)
Lilium (lily); most species
Muscari (grape hyacinth)
Narcissus pseudo-narcissus (daffodil), *N. jonquilla* (jonquil), and other species
Ornithogalum
Oxalis
Peonia (peony)
Platycodon (balloon flower)
Ranunculus
Scilla
Sparaxis
Tigridia (tiger flower)
Tritonia hybrid (montbretia)
Tulipa (tulip)
Watsonia
Zantedeschia (calla)
Zephyranthes candida (zephyr lily)

TRANSPLANTING

Ageratum (floss flower)

Begonia

* a-annual species; p-perennial species; f-plant in flat.

TIME TO START CUTTINGS

While the environment has much to do with the time plants start growth in the spring and ripen their wood in the fall, still it is possible to give approximate dates for starting certain cuttings. The following dates are listed primarily for the coastal and Great Valley areas, but gardeners in most regions of the state should find the following dates approximately correct. The gardener should watch the local climatic conditions and the way the plants respond, then make such local changes in the dates mentioned as seem to be desirable.

TABLE 4
CALENDAR FOR STARTING CUTTINGS

Winter period (Dec.-Feb. 15)	Spring (Feb. 15-May 15)	Summer (May 15-Sept. 15)	Fall and autumn (Sept. 15-Nov. 30)
<p>Dormant cuttings</p> <p><i>Chorizema ilicifolium</i> (flame pea or holly pea)</p> <p><i>Feltia amelloides</i> (blue marguerite)</p> <p><i>Fuchsia</i></p> <p><i>Kerria japonica</i></p> <p><i>Kokeuzia amabilis</i> (beauty bush)</p> <p><i>Lagerstremia</i> (grape myrtle)</p> <p><i>Ligustrum</i> (privet)</p> <p><i>Passiflora</i> (passion flower)</p> <p><i>Philadelphus</i> (mock orange)</p> <p><i>Polygonum amberti</i> (silver lace vine)</p> <p><i>Punica grandatum</i> (pomegranate)</p> <p>Roses; all dormant roses</p> <p><i>Scabiosa columbaria</i></p> <p><i>Tamarix parviflora</i></p> <p><i>Wistaria</i>; root cuttings with bottom heat or in open ground</p>	<p>Green soft cuttings</p> <p><i>Aubretia</i>; take before the blooming period</p> <p><i>Begonia semperflorens</i> (Vernon and other kinds)</p> <p><i>Calceolaria</i>; shrubby species</p> <p><i>Chrysanthemum moriflorum</i> (Florists' chrysanthemum); take in March</p> <p><i>Dahlia</i>; keep humid</p> <p><i>Dianthus plumarius</i> (spice pink); <i>D. coryophyllus</i>, (carnation) or other perennial species</p> <p><i>Diervilla</i> (weigelia)</p> <p><i>Feltia amelloides</i> (blue marguerite)</p> <p><i>Fuchsia</i></p> <p><i>Helianthemum</i> (sun rose)</p> <p><i>Mesembrythemum</i> (ice plant); all trailing species</p> <p><i>Passiflora</i> (passion flower)</p> <p><i>Pelargonium</i> (geranium and pelargonium)</p> <p><i>Pentstemon</i>; all species</p> <p><i>Salix</i> (willow); may root in water</p> <p><i>Sireptosolen</i></p> <p><i>Tamarix parviflora</i>; young laterals will root in water</p> <p><i>Thymus</i> (thyme) and other similar herbaceous plants</p> <p><i>Verbena</i>; vigorous shoots</p>	<p>Mature green cuttings</p> <p><i>Abelia grandiflora</i></p> <p><i>Aubretia</i>; take after blooming</p> <p><i>Bouvardia</i> hybrids</p> <p><i>Camellia japonica</i>; August cuttings</p> <p><i>Daphne odora</i></p> <p><i>Deutzia</i>; hardened wood</p> <p><i>Diervilla</i> (weigelia)</p> <p><i>Euphorbia pulcherrima</i> (poinsettia); start in individual pots</p> <p><i>Feltia amelloides</i> (blue marguerite)</p> <p><i>Forsythia</i> (golden bells)</p> <p><i>Fuchsia</i>; in sand or water</p> <p><i>Gazania</i></p> <p><i>Nerium</i> (oleander); in water or sand</p> <p><i>Sireptosolen</i></p> <p><i>Syringa</i> (lilac); take cuttings about June 1</p>	<p>Ripened wood cuttings</p> <p><i>Arcyuthia</i> (<i>Physanthus</i>)</p> <p><i>Begonia semperflorens</i> (Vernon or other type)</p> <p><i>Bignavillea</i></p> <p><i>Cenomones japonica</i> (Japanese quince)</p> <p><i>Chorizema ilicifolium</i> (flame pea or holly pea)</p> <p><i>Coloneaster</i>; all species</p> <p><i>Daphne odora</i></p> <p><i>Diervilla</i> (weigelia)</p> <p><i>Hardenbergia</i></p> <p><i>Kerria japonica</i></p> <p><i>Lagerstremia</i> (grape myrtle)</p> <p><i>Pelargonium</i> (geranium and pelargonium)</p> <p><i>Spyrea</i>; all species</p> <p><i>Viola cornuta</i> (tufted pansy or viola) and <i>V. tricolor</i> var. <i>hortensis</i> (pansy); take vigorous shoots</p>

HINTS ON THE CULTURE OF SOME ANNUAL FLOWERING PLANTS²⁰

ASTER (CHINA)

(*Callistephus chinensis*)



Fig. 9.—The China aster is one of the most popular annuals in California gardens during July and August. Many types and colors are available. The Comet type is shown.

Growers have a big choice in types and varieties of this popular flower. Asters are in their best bloom from July to September in California. Among the most popular types might be mentioned the American Beauty, with flat, straight petals; the King, with quilled needle-like petals; Comet (Crego or Giant-branching), with large flowers and curled or twisted petals, stem long and strong (fig. 9); Semples or Late-branching, similar to the Comet; Ostrich Plume, with large, loose, feathery heads like a chrysanthemum; Giants of California, similar

²⁰ Annual flowering plants discussed here include those plants normally grown from seed each season. For further reference see: Corbett, L. C. Growing annual flowering plants. U. S. Dept. Agr. Farmers' Bul. 1171:1-62. 1929.

to Ostrich Plume but center petals not so curled; Sunshine or improved anemone-flowered asters; Single, with only ray petals; and Pompon asters, bearing numerous miniature flowers.

Asters may be grown from seeds planted in flats at home, or small plants may be purchased from nurserymen. The principal points to watch are: selection of good varieties, rotation to prevent the development of disease, and proper control of yellows, stem rot, and root aphid. Stem rot or wilt is due to a fusarium fungus that rots off the stems of large plants near the surface of the ground. It is hard to control, but growing seedlings in sterilized soil and avoiding excessive moisture around the plants will help. The root aphid also attacks the stems just below the surface of the ground and may do serious damage unless killed with nicodust. Aster yellows is a virus disease spread by aphid or other insects, and therefore it is highly desirable to control aphid and rotate occasionally. Plants which are attacked with yellows might as well be pulled up and burned, for they are worthless. Screening against insect carriers may help.

CALENDULA

Calendulas or pot marigolds have been greatly improved in recent years and are particularly valuable for winter bloom in California, a time when flowers are rather scarce. Popular varieties include Campfire, or Sensation (fig. 10), Ball's Orange, Orange King, Lemon King, Radio, the Ball, and Meteor. Some of the new varieties are used mostly for forcing in commercial work, but those like Campfire do well outside. No serious pests or diseases occur, and the plants are hardy outside in most districts.

CALIFORNIA POPPY

(*Eschscholtzia*)

This native flower is so common that many people ignore its great beauty. The principal difficulty with it is the weedy appearance that follows the early bloom. This may be avoided to some extent by treating it as an annual and removing it after the best blooms are over, or by cutting back the stems and allowing new growth to come up, if it is treated as a perennial. The original deep-orange color is still very popular, but other excellent varieties that are now available include: Ramona, a frilled variety (fig. 11); Vesuvius, wallflower-red; Scarlet Beauty, deep scarlet; and Geisha, fluted. There are also double varieties. No serious pests occur.



Fig. 10.—The calendula or pot marigold has been greatly improved by the addition of such varieties as Campfire (Sensation) shown above. It is a very important flower because it blooms well in the cool months of the year when other flowers are scarce. (Photograph supplied by Chas. C. Navlet Co.)

LARKSPUR*(Delphinium ajacis)*

Larkspur or annual delphinium, a well-known hardy annual, is often planted in the fall for early spring or summer bloom. Recently the stock-flowered varieties have given new interest (fig. 12). La France, Exquisite Pink Improved, and Los Angeles are three good varieties. The principal troubles include red spider and occasionally a blackening of the stem, the cause of which has not yet been definitely determined. Good irrigation and good soil will prevent most of the trouble in home gardens.



Fig. 11.—The California poppy (*Eschscholtzia*), the state flower, is probably prized more in other states and countries than here, and yet the many excellent varieties should be grown more in home gardens. The variety shown is Ramona, one of the frilled forms. (Photograph by courtesy of John Bodger and Sons Co.)

PANSY AND VIOLA

Usually the pansy (*Viola tricolor* var. *hortensis*) is treated as an annual, though it will persist for several seasons in a mild climate.

Formerly separate strains of pansies with fairly definite characteristics were known to seedsmen, but some of these strains are not so distinct at the present time because of the crossing that has taken place. However, seedsmen still list many strains, such as Giant Trimardeau, Giant Cassier, Swiss Giants or Swiss Roggli, Mastodon, Bugnot, and more recently the strains of Steele, Ellis, and others.

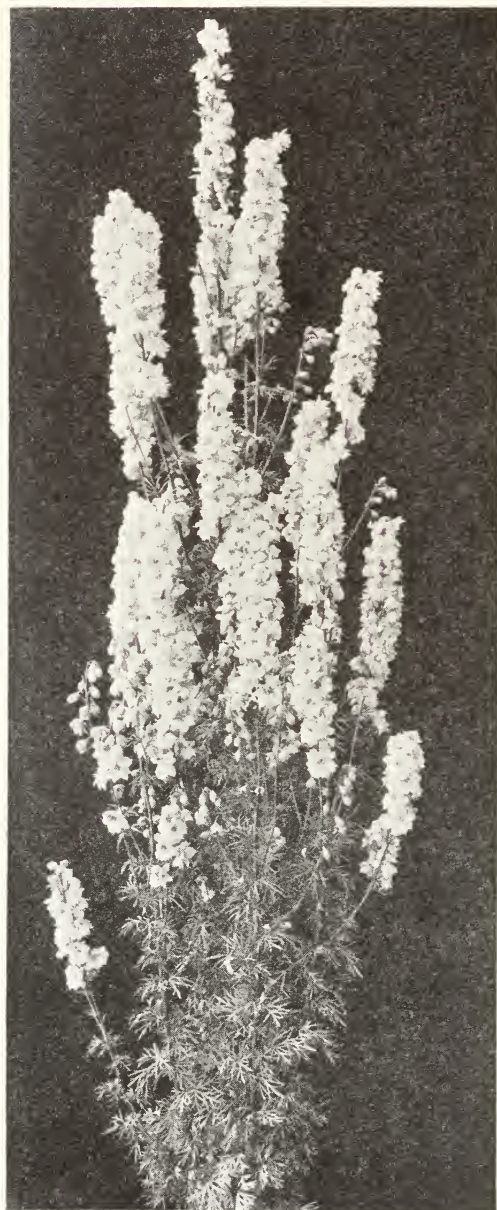


Fig. 12.—The new stock-flowered larkspurs are a wonderful improvement over the old garden annual as shown by the mass of tall spikes. Exquisite Pink Improved is the variety illustrated. (Photograph by courtesy of Chas. C. Navlet Co.)

The home gardener will only occasionally go to the trouble of growing plants himself when well-established plants can easily be purchased from nurserymen. Nurserymen, however, usually carry only ordinary strains. They rarely feel they can afford to pay from \$25.00 to \$35.00 an ounce for seed, as might be necessary for some of the large-flowered strains, such as the Swiss Giants and Steele's Giants, and then to retail plants for 35 to 50 cents a dozen, although this is actually being done in some cases. Gardeners who want the very best are more likely to get it by planting seed at home, unless some enterprising local nurseryman is specializing in fancy pansies.

Pansies like a cool moist situation but enough heat to make good growth. An east exposure with a free circulation of air is fine. Full sun for half or three-quarters of the day is usually desirable. A sunny exposure will be least subject to attacks of slugs, snails, sowbugs, and cutworms. More sun will be tolerated near the coast than inland. Extra shade may be provided where a hot sun is troublesome. Mulching with peat, leaf mold, or manure will help to keep the soil moist and cool about the plants. This mulching is very important for the best flowers. When pansy plants are set out, they should be protected from the sun for a day or so by shading with a shingle or piece of paper.

The soil should be rich, deep, and well drained. Pansies should be fertilized very liberally with a cool manure like cow manure. If further feeding is needed, add a little liquid manure, liquid commercial fertilizer, or soot water from time to time, but keep these liquid fertilizers off the foliage.

Old flowers should be removed to prevent an early decline on account of seed setting. Weeds should be kept down. Watering may be needed once a day, or possibly morning and evening in the driest weather. Slugs, snails, sowbugs, and cutworms, if present, should be controlled by scattering bran mash about.

If pansies are to be grown from seed, good seed should be used, but it makes little difference whether the seed comes from Oregon, England, France, or Switzerland, so long as the color meets the grower's approval. The seed should not be started until local growing conditions are good. In heavy, cold, moist soils it may be best not to set the plants in the open until the weather warms up in the spring. If winter conditions are mild then the fall-grown plants will be likely to prove satisfactory. Since early deep rooting is desirable, planting should be done as soon as conditions promise to be satisfactory. Outside temperatures of 50° Fahrenheit are needed before much root growth can be expected. Seed may be started about two months before

the time for planting outside. More time will be needed if the growth is slow on account of cool weather. Seedlings 1 inch high may be set in the flats and these in turn will be ready for the outside when they are 3 or 4 inches high. Unless the pansies are given regular attention they may be inferior in size of bloom.



Fig. 13.—A dwarf strain of the large California Ruffled Giant petunias has recently been introduced and should prove valuable for potting. (Photograph by courtesy of Chas. C. Navlet Co.)

Violas or tufted pansies (*Viola cornuta*) are valued for massing and some kinds, such as Jersey Gem, live more than one year. Popular varieties include Jersey Gem, Lavender Gem, Papillio, Apricot Queen, Cyclops, Blue Perfection, Radio, and Lutea splendens. Varieties like Jersey Jewel are intermediate between the pansy and the *V. cornuta* type but have the long blooming habit of the latter. Still other hybrids more like the pansy than the viola are available.

The colors of violas may be listed as white, yellow or apricot, blue or violet, and variegated. Many varieties are available in these different color ranges.

PETUNIA

The small weedy petunias of our grandmothers' gardens are not to be confused with the improved varieties of today. There is still need for the small, single-flowered varieties and dwarf plants for bedding purposes. Rosy Morn and other popular bedding varieties of

dwarf habit do well in beds, but some of these varieties which set seed have to be watched to prevent seeding in paths. On the other hand the large, ruffled, fringed, and double varieties do not set seed under ordinary garden conditions so are not troublesome about being scattered. Some of the tall balcony petunias are being used along fences, pillars, and in window boxes. California has several specialists growing the large ruffled petunias, and certainly these large-flowered sorts add considerable color to the garden. There is a dwarf strain (fig. 13) of the Ruffled Giants, which has been recently developed. Good seed of the best ruffled varieties may cost as much as 50 to 75 cents a packet.

If the plants can be ready for setting out from late in May to the first of July there will be plenty of time for good bloom. Some gardeners replace pansies with petunias. In growing petunias from seed there is some danger of damping-off. This can be largely prevented by adding sand to the seed-bed surface; some specialists have suggested fine charcoal, which acts similarly. Fine gravel has helped to keep a dry surface in the seed flat. The seed should be covered very lightly. No serious pests of the petunia occur in most gardens.

In growing double petunias, the weaker plants are most likely to be double. All seed for double petunias comes from single-flowered plants that have been selected for their ability to produce a large percentage of double flowers.

SALPIGLOSSIS

Salpiglossis, a member of the tobacco family, may be treated much like the petunia. It is valuable for bedding and massing. Seed may be sown early in seed flats or later on in the open. A fairly rich well-watered soil gives the tallest plants and the best flowers. The flowers are usually at their best in June, July, and August. Some plants live over more than the one season and will be in bloom late in May where the climate is mild. There has been a little trouble about damping-off or rotting of the stems at the surface of the ground. Growing plants in full sun with good drainage will help to prevent this trouble. Plant in different soil each year.

SCABIOSA

There are both annual and perennial scabiosa varieties. The old pinecushions or mourning bride represent the annuals, but now better size and color are offered in annual scabiosa (fig. 14).

The greatest improvements have come in the perennial scabiosa. For many years the blue bonnet (*Scabiosa caucasica*) was grown in a limited way in gardens, but the pink-flowered *Scabiosa columbaria* has

recently taken the fancy of florists and gardeners. The flowers range a little smaller than in the blue bonnet and are decidedly pink. The stems of the plants have a tendency to root where they touch the moist soil. In most respects this species is better for the home garden than the older species. We should also mention the Isaac House hybrids, which are an improvement over the *Scabiosa caucasica* species. *Scabiosa japonica* is also a perennial species with lavender-blue flowers. It is



Fig. 14.—Annual and perennial scabiosa varieties are more popular than ever in California home gardens. Shasta is the annual variety shown above. (Photograph by courtesy of Chas. C. Navlet Co.)

desirable to start the seed early enough to get the scabiosa plants outside just as soon as the weather is favorable for growing in the early spring. Aside from a few aphids the scabiosa has no very important pests or diseases.

SNAPDRAGON

(*Antirrhinum*)

The snapdragon is one of the most popular garden flowers in spite of the fact that it is subject to the snapdragon rust. Growers have a choice of the dwarf, intermediate, and tall varieties and also one race of hybrids. The nurseryman often grows an early crop for his trade

but the home gardener will usually find that there is less trouble with rust if planting is delayed until the spring months when growing conditions are better. Rapidly growing, vigorous snapdragon plants set out in the spring are fairly resistant to rust. They should be in before hot weather comes on in order that they may be well established and in the best condition to resist the attacks of the rust fungus, which is most serious in hot weather.

The culture of the snapdragon is not difficult except that the watering should be done in such a way as to leave the foliage dry over night. It may be done in basins or else early enough in the day so that the plants will dry off before night. The soil should be kept as dry on top as will still permit a good growth of the plants. No insects are likely to be very troublesome.

STOCK

(*Mathiola*)

There are two general groups of stocks—those used primarily for their summer bloom and those planted for winter or early spring bloom. All of the stocks are excellent for bedding purposes and they are also good for cut flowers in the home. The fragrance is pleasing. The so-called ‘ten-weeks stock’ (*Mathiola incana* var. *annua*) is the popular summer-flowering class, but the Nice or Cut-and-Come-Again (*Mathiola incana*) class is also used some for winter bloom. The Giant Imperial (Bismarck) (see fig. 15) belongs to the summer-flowering class but is superior to the Nice class in nearly every way. The Brompton or winter stock is a perennial form of common stock with large flowers, but it requires a long time from seed to bloom and is therefore not very popular. The Giant Perfection may be grouped with the Nice stocks. Probably all the classes mentioned are variations of one species without distinct botanical differences. Special varieties will be found under the various classes. Particular mention may be made of the variety Empress Elizabeth in the winter stocks, and Golden Rose in the Imperial class, both pink in color. Antique Copper is another variety in the Imperial class, but it is more odd than beautiful. Elk’s Pride in the Imperial stocks is intense royal purple. All double-flowered stocks are propagated with seed taken from single-flowered plants, since double flowers set no seed; only strains producing 75 to 85 per cent doubles should be used.

Stocks are best started in seed flats and later transplanted to flats, then finally to the open ground where growing conditions are favorable. At no time should the plants be allowed to become stunted.

Stocks are troubled by aphid and by a soil fungus that rots the stems near the surface of the ground. Aphid can be controlled by applying tobacco sprays or dusts, and the soil fungi can be best controlled by not over-irrigating. Rotation from year to year also helps to check the soil fungi in any particular bed.



Fig. 15.—The Giant Imperial or Bismarck stocks are excellent for summer and winter or early spring bloom, either in the garden or as cut flowers. (Photograph by courtesy of Chas. C. Navlet Co.)

SWEET PEAS

(*Lathyrus odorata*)

California leads all the states in growing sweet peas commercially, normally having from 1,500 to 2,000 acres for seed purposes alone. This means that conditions are very favorable for sweet peas, par-

ticularly adjacent to the coast. Sweet peas can be grown even in the warmer areas if some shade is provided. Red spider and similar pests seem to be much more troublesome in the hot inland districts than near the coast. Sweet peas are injured by great variation in temperature between night and day, as indicated by a failure to set bloom until the nights become warmer. Sweet peas demand a fairly deep, fertile soil to do well. Flowers are rarely good where the soil is not deeply prepared and does not contain considerable lime. Acid soils should be avoided.

The time for planting will be regulated by the soil, moisture, and temperature conditions. If the fall and winter months are not too cold and the soil reasonably well drained, then fall planting is to be preferred because early planting favors deep rooting. In turn, those plants that have an extensive and deep root system are most likely to have the most and best flowers. Sweet peas planted later will come into bloom nearly as soon, but will not have a root system that can support as many or as good flowers. Good growing conditions early in the season seem to be particularly desirable. If the winter is very cool and the soil heavy or wet, spring planting will give the best results. Planting in pots for transplanting later can be used in an emergency for the very earliest flowers, but outside planting is the rule in California. Slug and snail damage can be partly avoided by transplanting larger plants grown in pots.

Since results are often poor on shallow soils it is a good plan to turn the soil over to a good depth and incorporate cow manure so that there will be good drainage and high fertility after the seed is planted. This should be done well in advance of planting so that the soil will be settled and the manure completely rotted. The soil should be free from excess clay. If necessary lime may be added to insure good tilth.

As a rule it is well to plant the seed moderately close and thin out later on. The important question of distance between plants in a row relates to mildew and sunlight. Where plants are too close they may lack sufficient sunlight and may remain rather damp. These conditions favor mildew and the dropping of the buds. Thinning out the plants in the seed row and even cutting out surplus lateral growth aid in the control of mildew. Incidentally, the best exhibition blooms may be had by a judicious thinning of the plants and the laterals and training to stakes, but excessive pruning is not very practical for the ordinary person. Quantity of bloom is more important than extra length of stem and size of bloom.

Extra feeding of the sweet peas will often improve growth and the quality of the blooms. The best Spencer-type flowers should have four blooms to a stem (fig. 16), but lack of fertility and poor care may result in only two or three blooms to a stem and even the dropping of the blooms. Liquid manure may be safely given once a week after the first buds begin to show.

The training and support of sweet peas is important. Chicken wire is satisfactory near the coast where temperatures are not high. Brush is better inland where the sun is hot. Wooden lattice-work and string can be used also, but string is not very satisfactory because it is not strong and cannot be made tight enough. The stems will not start to climb until they are 8 to 12 inches long. Then the first mature tendrils can be hooked over the wire or other support and in a short time the new tendrils formed will take hold. Unless the tendrils do take hold well a strong wind may blow the plants over.

All old flowers should be removed to prevent seed setting. Old plants may sometimes be cut back and forced into new growth under very favorable conditions.

Sweet peas are subject to several serious insect pests and diseases. Mildew is perhaps the most common disease and unless controlled by careful watering and thinning of the plants may seriously injure the flowers. Sulfur and other fungicides may be applied but are not very satisfactory. A good vigorous growth aids the plant in resisting mildew attacks. Leaving the foliage dry overnight is desirable.

A soil fungus sometimes attacks the stems near the surface of the ground. This is worst where the sweet peas are planted early in rather heavy wet or cold soil. Later planting may prevent this difficulty.

The sweet pea mosaic disease is caused by a virus type of organism and is identified by the appearance of black streaks on the vines and by water-soaked areas in the flower petals. Plants attacked decline early and are rendered practically worthless. Since it is now believed that such mosaic diseases are largely spread by certain insects such as aphids and leafhoppers, it is important to control these insect pests by regular spraying with 40 per cent nicotine sulfate sprays. It may also help to use only seed taken from plants known to be free from disease, such as is supplied by the reliable commercial seedsmen.

Red spiders may do considerable damage. They will be less troublesome if plants are kept well watered and vigorous. Fine sulfur may be used if control is necessary.

The green worm is a rather common pest on sweet peas and is best controlled by spraying with neutral lead arsenate. This insecticide

may be combined with the tobacco spray, using about 1 ounce of the dust for each 3 gallons of water.

Birds and rabbits may eat the young plants and can only be kept off by a tight screen. In some cases it may be impractical to try sweet peas.

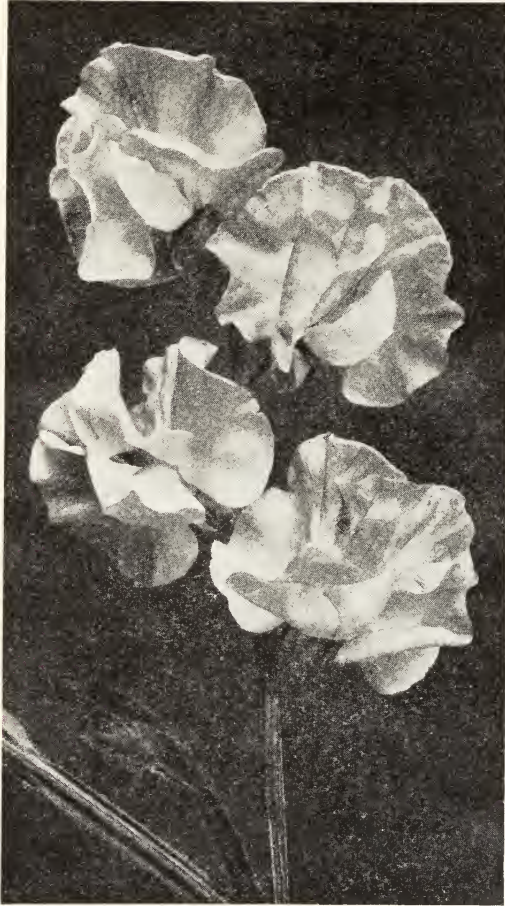


Fig. 16.—California leads the United States in the production of sweet peas. The variety *Idyl*—salmon pink on cream—has been listed among the twelve best standard Spencers for garden decoration. (Photograph by courtesy Ferry-Morse Seed Co.)

Since several fine new varieties of sweet peas are added each year, it is not practical to give a very extensive list here. In order that the beginner may have something tangible from which to work, twenty-four best late or standard, and the best twelve early-flowering Spencer

sweet peas for garden decoration will be given, as recommended by a California firm specializing in sweet peas. Other excellent varieties are offered and may be well adapted for special conditions. In the list of twenty-four best standard Spencer sweet peas, the best twelve varieties are given first.

Standard or late Spencer sweet pea varieties—

Avalanche—white
Glean eagles—light blue-lavender
Idyl—salmon pink on cream (fig. 16)
Mary Pickford—cream pink
Olympia—rich purple
Pinkie—deep rose-pink
Powercourt—lilac-lavender
Reflection—clear blue
Supreme—pale blush-pink
Sybil Henshaw—crimson
What Joy—deep cream
Youth—white edged with soft rose-pink
Campfire—cerise
Carmelita—flushed, white ground
Charming—deep cerise
Chieftain—deep mauve
Del Monte—Pelargonium-pink
Dora—bicolor
Doreen—rich carmine
Hero—rose-cerise
Huntsman—scarlet
Picture—cream-pink
Sunset—bright rose
Warrior—maroon

Early-flowering Spencer sweet pea varieties—

Early Blue Boy—clear blue
Early Chevalier—rose self
Early Columbia—pink and white
Early Giant Rose—rose pink
Early Harmony—lavender
Early Queen Crimson—crimson
Early Silver Blue—light blue-lavender
Early Snowstorm Improved—pure white
Early Springsong—salmon-pink on cream
Early Superior Pink—rose-pink flushed salmon
Early Torch—salmon-orange
Early Vulcan—vivid scarlet

VIRGINIAN STOCK*(Malcomia maritima)*

This excellent little annual flowering plant should be better known in California because it adds a great amount of color to the duller parts of the home garden where the soil is reasonably moist. Once the plants are started they will reseed themselves and come up year after year unless turned under by cultivation. The spring crop that is seeded in the fall will bloom about April and May and may be used to furnish color in daffodil and tulip beds after the earlier flowers have finished blooming. Another sowing in May will be in bloom late in June or early in July to help add color near irises and similar plants after they are past blooming. Seed may be saved from the summer crop to plant the next season.

ZINNIA

A very great advance has recently been made in the zinnia. The size of the flowers, the range of color available, and the form of flowers all have a large appeal to gardeners in the warmer sections of California. Near the cool coast the zinnia will grow and bloom but the flowers fail to reach the perfection found inland or where there is plenty of heat during the growing season.

Among zinnia types are the large dahlia-flowered zinnias (fig. 17) with no center showing, the Mammoth type with only a small center, the miniature type known as Pumila, Liliput, or Pompon, and Haagaena, another dwarf. The Red Riding Hood variety is of a compact form covered with button-like scarlet flowers.

Zinnias are not very subject to disease or insect pests when grown where they have plenty of water and a fertile soil. They should be planted in the full sun after the weather has warmed up well. Sluggish growth brought on by drouth and cold is not favorable to good blooms or continued health. Cold nights are injurious. A virus disease kills some plants and is best checked by control of all insects and by planting on new soil each year.



Fig. 17.—The zinnia reaches its perfection in the warm inland valleys of California. (Photograph by courtesy of Chas. C. Navlet Co.)

HINTS ON GROWING CERTAIN POPULAR HERBACEOUS PERENNIALS²¹

ASTER (PERENNIAL)

The perennial aster or Michaelmas daisy of the gardens is too well known to need special mention except to say that certain varieties are especially popular, such as Climax in violet-blue, Barr's Pink in bright pink, and St. Edgwin in rosy pink. Many others will be described in catalogs.

Recent interest has been largely devoted to other perennial asters or aster-like plants. *Aster yunnanensis*, a low, blue aster, and *Aster alpinus* in violet to pink and white, are important in rock gardens. *Aster sub-coeruleus* in bluish-violet has also been widely grown. *Erigeron glaucus*, the wild beach aster of California, is charming. *Erigeron alpinus* is similar. The former is purple, the latter lavender-blue. Plenty of moisture and not too much heat or shade will be needed.

CAMPANULA

Canterbury bells (*Campanula medium* and *C. calycanthemata*) are grown more than other species of campanulas. The plants usually bloom the second year and then die, but some may persist until the third year. Other species of campanulas include *Campanula carpatica*, 9 to 18 inches high and with single deep-blue flowers; *C. barbata*, 6 to 9 inches high with nodding pale-blue flowers; *C. garganica* var. *hirsuta*, low-growing and suited for window boxes and borders, with flowers pale purplish-blue and star-shaped; *C. laueri* (not *C. lorei*), 1 foot high with pale-blue flowers; *C. isophylla*, valuable for hanging baskets, either pale-blue or white flowers; *C. portenschlagiana*, suitable for borders, with small blue-purple flowers; *C. persicifolia*, (peach bells), 2 to 3 feet high with blue or white flowers; *C. pyramidalis* (chimney bells), often 4 to 5 feet, with pale-blue flowers; *C. rotundifolia* (blue bells of Scotland), 6 to 12 inches high with bright-blue flowers.

²¹ Herbaceous perennials are plants which live for more than two years; biennials normally bloom the second year and then die. This section includes both groups with the exception of the bulbs and tuberous-rooted plants, which are given in another section. Azaleas and hibiscus are treated under evergreen perennials (see pages 139 and 145), because most of the varieties grown in California are evergreen.

For further reference see: Mulford, F. L. Herbaceous perennials. U. S. Dept. Agr. Farmers' Bul. 1381: 1-84. 1929.

CARNATION

The average home gardener is less interested in winter carnations than the commercial florist. The winter or commercial carnations require very careful attention if they are to do well. The best-quality blooms are only secured under glass, though fair quality may be had outside in parts of central and southern California. In the case of bedding carnations (*Dianthus caryophyllus*) there is little trouble about split calyxes as compared with the winter carnation. The fact that the bedding carnations will bloom in five to six months from seed and that the bloom comes mostly in the summer months has made this group of considerable interest to home gardeners. Unfortunately the bedding varieties have been listed only under colors until recently, when some named varieties have been offered. The following varieties of bedding carnations are representative of the color range:

San Remo—pure yellow	Beauty of Nice—rose-pink
Villa Franca—white	Mentone—scarlet
Cannes—pearl-pink	Monaco—velvety crimson

Most seed dealers list special strains of the bedding carnations under such names as Chabaud, Riviera, and Marguerite.

The well-known florist varieties of winter carnations are of some interest to home gardeners having green houses or favorable outside conditions. The following list of winter or florist carnations will represent the more popular varieties:

Alma Ward—white	Main Sunshine—yellow
Donald—dark crimson	Matchless—white
Bettie Low—cerise pink	Morning Glow—light pink, good keeper
Enchantress Supreme—salmon pink	Mrs. C. W. Ward—medium pink
Hilda—pink	Red Laddie—red
Ivory—white	Rose Pink Enchantress—pink
Laddie—pink	Ward Improved—deep pink
Lawson—red	White Wonder—white

Most varieties of winter carnations remain popular for not more than ten years, though there are exceptions, as in the case of Rose Pink Enchantress and Mrs. C. W. Ward. Deterioration in the quality of the blooms of a variety through disease or injurious methods of propagation may be partially to blame, but the desire for something new will also explain some of the shifting in popularity. Florist's magazines may be consulted for the new varieties as they are introduced.

Outside carnation culture has been important commercially in parts of southern California. Methods used for the commercial varieties will apply equally well to the bedding varieties. Old flower

stems should be cut back after the spring or summer bloom is past. The young rooted cuttings are pinched back after they are planted to encourage low branching.

Exhibition blooms are always disbudded, leaving only one bud to the stem. Feeding with liquid manure will be needed for the best bloom. A mulch about the plants will help. Old leaves should be removed and the plants supported by wire or stakes in case the stems are long. Regular attention is essential for good results.

There has been much trouble about the splitting of the green calyx on carnations, and unless the plant is kept in continuous healthy growth there is bound to be trouble. Red spider, thrips, and other pests which check growth must be controlled by spraying. Watering should be frequent enough to keep the plants vigorous. A check in growth may result in trouble, but the bedding varieties will be most resistant. Spots and other diseases are not very serious outside but insect pests should be controlled.

CHRYSANTHEMUM²²

The fact that as many as eight carloads of chrysanthemum blooms have been shipped out of central California from the vicinity of Redwood City and other Peninsula points in one day shows that chrysanthemums thrive under the coast climatic conditions. Practically all gardeners can grow some variety of chrysanthemum satisfactorily, whether the district be in the hot interior or near the coast. More shade and water will be needed inland but the fact that very good chrysanthemums have been shown at Fresno, Pomona, Pasadena, and other inland points demonstrates that even the large-flowered varieties can be well grown in home gardens if given proper attention. This takes considerable experience and several years may be needed to find out just what varieties do best and just when the buds should be selected for the best blooms. The smaller-flowered varieties are entirely satisfactory for home use, in fact, better in some respects than the 6 to 10-inch blooms secured by forcing, and they need no special attention. Types of chrysanthemums may be classed as follows:

Large-flowered—mostly Commercial and Exhibition blooms

Incurved

Reflexed

Large Single and Anemone

²² See also: Morrison, B. Y. Chrysanthemums. U. S. Dept. Agr. Farmers' Bul. 1311: 1-16. 1923.

Medium to small-flowered

Anemone—large and small-flowered

Caps and Decoratives—usually double and full to the center

Single—large and small

Pompon—large and small

Novelties—quilled, spidery, thread, and ostrich-plume flowers



Fig. 18.—The large chrysanthemums are beautiful but require considerable experience and skill for the best results. The variety shown is Louisa Pockett. (Photograph by courtesy of Western Homes and Gardens.)

There are scores of chrysanthemum varieties, and because of differences in season, color, and form, even a list limited to well-tested and important varieties is necessarily rather long. Catalog descriptions may be used to narrow the following list to those varieties which seem to satisfy individual preferences best.

Large-flowered, Incurved and Reflexed

Pink

Chieftain
Helen Frick
Mrs. J. L. Davis (Pink Turner)
Thos. W. Pockett
Unaka
Vermont

Yellow

Col. Appleton
Col. J. F. Piper
Maj. Bonnafon
Mrs. Rigby
Nagoya
Yellow Chieftain
Yellow Pockett, light and deep-
yellow strains
Yellow Turner

Bronze

Bronze Turner
Hilda H. Bergen
Nagirroe
Tekonsha
Wm. H. Waite

Red

C. H. Totty
Geo. Hemming
Mrs. G. G. Mason

White

Louisa Pockett (fig. 18)
Mrs. Gilbert Drabble
White Chieftain
William Turner

Lilac or silvery rose

May Hunter

Smaller hardy garden varieties

Caps and Decoratives

Butler's Caprice—deep pink
Crimson Source D'Or
Kathleen Thompson—crimson
Lilac Cap
Lizzie Adecock—yellow
Source D'Or (Golden Feather)
Purple Cap
White Cap
Yellow Cap

Large-flowered Pompons

Anna L. Moran—flame-scarlet
Captain Cook—rose-pink
Golden Climax—orange-yellow
Lilian Doty—light pink
Red Doty—wine red
White Doty—white
Yellow Doty—yellow

Single varieties

Baby Portola—maroon-red (late)
Bronze Buckingham
Bronze Molly
Golden Mensa
Gretchen Piper—yellow
H. Marie Totty—crimson
Ida Catherine Skiff—amber
Kitty Riches—early pink
Louise Mayo—pink
Mrs. W. E. Buckingham—pink
Mrs. E. D. Godfrey—light pink
Old Gold—gold

Small-flowered Pompons

Baby—yellow
Baby Doll—yellow shaded pink
Baby Marguerite—white
Baldwin's Scarlet—scarlet
Button Rose—rose
Little Gem—lavender-pink
Vivian Martin—anemone-flowered,
creamy pink with yellow center
White Gem—white

Anemone-flowered chrysanthemums

Clemencia—pink
Coed—pink
Godfrey's Perfection—white
Graf Von Oriola—rose-pink
Red Bird—ruby-red
Titian Beauty—bronze
Tronesta—early pink
Wee Wah—bronze-yellow

Novelties

Fugi—lavender, long thread
Patricia Grace—shell-pink, tubular petals, rather large, suitable for
exhibition.
Sam Caswell—white thread with three-pointed tips

Chrysanthemums are best propagated from the moderately soft tips, a form of green soft cuttings. They should be 4 or 5 inches long, with bottom leaves removed, top leaves pinched in half (fig. 7c). They should be rooted in coarse sand (No. 4) about the first of March.

Special boxes or sand beds should be used. If cuttings are rooted in the open they should be protected from the sun with white cheese cloth or else glass and newspaper. Offshoots can be used where disease is not serious and only the small-flowered, hardy varieties are grown, but exhibition flowers should always be grown from rooted tip cuttings.

Chrysanthemums do best in a heavy loam but will grow in any soil that is well fertilized and watered properly. The rooted cuttings should be planted about the first of May. Very early planting often causes the growth to be too tall and the wood to become hard prematurely. The late blooms find the most favorable weather conditions as a rule. They should be planted with the top roots approximately an inch or two beneath the surface. Plants should be far enough apart in the row to allow for cultivation and the work of disbudding.

Water should be given often enough to keep the stems soft and the leaves healthy. Overhead sprinkling is needed for the best results but should be discontinued as soon as color shows in the buds.

Mulching with well-rotted manure is a good practice and may be followed by applying liquid manure daily or weekly (according to strength of the manure water) as soon as the first buds show. With the large-flowered varieties the liquid manure should be discontinued as soon as color shows in the buds. Excessive fertilizing may cause a cracking of the necks and burning.

Plants should be staked with 5-foot stakes to prevent injury in the wind. One tie is usually better than two or more.

Exhibition blooms may be produced on plants set out about May 1, and if necessary cut back to 8 inches from the ground about July 1 to be sure of a vigorous soft stem and fleshy leaves. Feeding with liquid manure is essential. Disbudding is always practiced for the large flowers. The time to select a bud will depend on the variety and the growing conditions. The first buds which form are called 'crown' buds. Laterals will form near the crown buds and on the ends of these will be clusters of buds called 'terminal' buds. No laterals appear after the terminal buds form. In a few varieties the crown bud is saved and all laterals removed, while in many varieties the crown bud is removed and one to three laterals saved; each lateral is finally disbudded to leave one terminal bud on a stem. Many people will prefer to have about three laterals with medium-sized blooms to a plant, rather than one large bloom. In most varieties the crown bud produces an inferior bloom; in such cases the best terminal buds should be saved. Many catalogs suggest the approximate time to select the buds for best results, but the grower will have to experiment for himself to be sure.

The time for selecting buds ranges from the middle of August to late in September. Buds should not be selected before the middle of August unless the varieties are early and there is a place for forcing.

Commercial large blooms are protected with cheese cloth stretched over a framework to exclude insect pests and protect the blooms from unfavorable weather and dampness. Some similar protection will be needed for exhibition blooms at home. A weekly spray with 40 per cent nicotine sulfate and whale oil soap or an application of nicodust on warm days will help to control aphids, tarnished plant bug, thrips, and midges.²³ A daily morning hosing-off of the plants will remove all spray sediment. Slugs and snails should be controlled in the usual way.

DELPHINIUM (PERENNIAL LARKSPUR)

Special mention is made of the delphinium because California flower growers are finding conditions particularly favorable for this excellent perennial. Great improvement in the varieties of delphinium has taken place during the past few years. Formerly the individual flowers were mostly single and not particularly pleasing in size or form, nor were there the wonderful combinations of blue and pink that are so common now in the best American strains. Americans seem to fancy the lighter blues and pinks, whereas the English strains run more to the darker blues. Nevertheless the Wrexham, Blackmore and Langdon, and other English strains are excellent and popular here in California.

The Vanderbilt, Burns, Bobby, Shaw, and other Pacific Coast strains are being extensively planted. The beginner might try a seed packet of some of the recognized strains and select the most promising seedlings. There are great possibilities as to the length of the flower head, the size and spacing of the flowers on the spike, doubleness, and other points of merit which the delphinium grower watches closely. Flowers with dark background petals and pink petals inside or pink petals edged blue seem to be very popular. White and yellow strains have not been very satisfactory in color or vigor. Some of the best strains in color and shape have proved disappointing in persistency of the plants, but great improvement in this respect has been accomplished in some California strains. Mixtures of the best strains are often listed in seed catalogs.

Delphiniums demand a well-drained soil that is moderately moist and contains plenty of lime. The addition of refuse mortar to a heavy

²³ For chrysanthemum insects see: Weigel, C. A. Insect enemies of the chrysanthemum. U. S. Dept. Agr. Farmers' Bul. 1306:1-36. 1923

soil should greatly improve it for delphiniums. Ordinary air-slaked lime is also good. The soil must have plenty of organic matter (well-rotted barnyard manure) and nitrogen for the plants to reach their best. A lack of moisture, lime, or nitrogen will tend to result in short spikes and general poor growth. Plants that might be 6 feet high may only reach 3 feet, and many of the younger plants will fail to overwinter. The mortality of young plants the first winter is often high, especially in some strains, and some of the best colors seem to disappear in a large bed that is neglected.

There will be a large spring bloom and, if the seed spikes are removed and the plants given more fertilizer and water after a brief rest, a second late summer or fall bloom. Young seedlings often produce a very creditable bloom late the first year; in fact, some of the flowers in the small spikes reach an enormous size. It is best to remove those flowers on very small plants so the plants will not be weakened by seed formation.

In order to prevent mildew, watering of delphiniums should be by flooding or basin irrigation rather than by sprinkling. If overhead sprinkling is practiced, the watering should be done early enough for the plants to dry off before night. Water will be needed in between the different crops of bloom.

Delphiniums are occasionally troubled with mildew, blight, and other fungus diseases. Damping-off of the seedlings may largely be avoided by pouring boiling water over the soil about a day in advance of seed planting. The seedlings should never be permitted to dry out. Old plants will usually begin to decline after three or four years and should then be replaced.

Slugs, snails, and sowbugs do considerable damage to young plants; every effort should be made to control such pests by scattering lime about the clumps and by keeping a poison bran mash out during the growing season. Delphiniums should be planted where they can be given proper attention without interfering with other flowers. The plants should usually be in beds by themselves or in back of low-growing border plants.

GAILLARDIA (BLANKET FLOWER)

This large daisy-like flower requires good drainage and not too much shade. There are many fine perennial varieties from which to choose. Portola, Dazzler, Sunset, and Crimson Glow are some of the best varieties. A new yellow strain is also sold in California. The gaillardia may be used as a low edging plant and for cut bloom.

GERBERA (TRANSVAAL DAISY)

Judging from recent interest at flower shows only a few home gardeners have seen the improved gerberas now being grown and sold in California. Colors range from yellow through crimson, rose, pink, white, and lilac shades. The greatest improvement has been in size of bloom and in color. Some fine strains are being sold in southern California, but fully as good blooms are being raised in gardens farther north, where special attention has been given to seed selection for a period of fifteen years. Any home gardener can have equal success in raising this very beautiful flower provided there is plenty of heat to insure good growth and winters are not too severe. This means that the best results will be had either near the coast in southern California or just back from the coast farther north. Gerberas may grow and bloom near the coast and even inland but they are not happy where the weather remains cool or where the winter temperatures are severe.

Gerberas will bloom over a long period but have been said to bloom best in summer. Winter bloom is not uncommon in places where the weather is warm, as in the warm foothill belt of central and southern California. Well-established plants of the best varieties in different colors are available and will be suited to many home gardens. Many gardeners will continue to use seed, though growing from seed is somewhat difficult and takes considerable time. Seed might be substituted for plants as the gardener gains experience in propagation work.

GEUM

Interest in geums has come with the development of three double varieties, namely Mrs. Bradshaw (red), Lady Strathedon (orange-yellow), and Orange Queen (color in between the other two). Geums are easy to raise from either seeds or plants. They have practically no pests. Old seed stalks should be removed to encourage new blooms of desirable size and to prevent the germination of seed in nearby flower beds. Water should be applied fairly often for good growth. Disbudding will be needed for the largest flowers. The base of the stems should be scalded in hot water to make the flowers keep well when cut.

PENTSTEMON

Pentstemons are often recommended in place of snapdragons when snapdragon rust is serious. The pentstemons are similar in appearance and have very few troubles, but the flowers do not keep as well when cut. There is a caterpillar that likes pentstemons and must be hand-picked or the foliage sprayed with lead arsenate to prevent trouble. Pentstemons like a well-drained, fertile soil and will not do well on a soil that is kept saturated with water. A cool place in the full sun is best.

The large-flowered pentstemons (*Pentstemon gloxinoides*) have been grown in many California gardens. Named varieties like Sensation and Sensation Improved have been outstanding for their size and color. More recently home gardeners have begun to realize the merits of some of the smaller-flowered western native species running to pinks and blues or lavenders. Certainly these natives are well adapted for home use and are superior in coloring to many of the old garden varieties. *Pentstemon heterophyllis* has been called the best of all the pentstemons and its spikes of brilliant violet-blue are worthy of any garden. *Pentstemon rupicola* is another native with greyish foliage and bright rose-pink flowers; it grows in a dry location. *Pentstemon procerus* has violet to blue-purple flowers.

PINKS

(*Dianthus*)

There are many species of garden pinks being grown in gardens in California (fig. 19). The increased interest in rock gardens has given more emphasis to the planting of pinks. The Chinese pink (*Dianthus chinensis*) includes many strains, the variety Heddewigi being most common and usually treated as an annual. The old spice pink (*Dianthus plumarius*) is still popular for the late spring bloom. Alwoodi pinks, hybrids produced by crossing with the carnation (*Dianthus caryophyllus*), are extensively grown. Many of the garden pinks now being passed from one neighbor to another are of this hybrid origin. Seedlings also appear in many gardens. The blooming season is longer than in the ordinary spice pink. Still another hybrid group has recently been developed by crossing the Alwoodi pinks with the sweet william to give annuals of the general habit of the sweet william but with individual flowers more like the pinks. This

hybrid race is usually listed as sweet wivelsfield. Still another cross between the Alwoodi pinks and *Dianthus alpinus* has resulted in long-flowering perennial pinks listed as Alwoodi alpinus.

Reference to any of the catalogs dealing in rock plants will bring out such species as *Dianthus caesius* (cheddar pink) and *D. deltoides* (maiden pink). These other species are interesting and have their place in some gardens, but the spice or clove pink will probably retain its present popularity. The well-known sweet william (*Dianthus barbatus*) has good listed varieties, like Newport Pink, the best salmon pink.



Fig. 19.—The *Dianthus*, or perennial pink, has been extensively used as a border plant in home gardens. There are several species suited to rock gardens, and new hybrids are adding to the deserved popularity. (Photograph by courtesy of Germain Seed and Plant Co.)

PHLOX

Experience has taught that the well-known perennial phlox (*Phlox paniculata* and *P. maculata*) only occasionally does well in California. Some gardeners of the north coast and also in the citrus belt of southern California have had very satisfactory results. A southern California nursery lists over a dozen named varieties and the plants

are doing very well, considering the dry climate. Persons who are interested should test out a few popular varieties like Professor Schliemann (lilac-rose) and Rynstrom (rose-pink) to see how they thrive under local conditions. Other colors ranging to lavender, lilac, lavender, salmon, and red are available in California nurseries.

Other perennial species of phlox have done very well near the coast in the northern portion of the state. *Phlox subulata* is a gem in the rock garden when the right conditions are provided. *P. amoena* is another species which has done well in rock gardens in central California near the coast. Good drainage, cool growing weather, and some moisture with fertile soil is about all these phloxes need. The perennial phlox first mentioned is in bloom from July until fall, the other low-growing phloxes bloom in the spring. *P. drummondii*, an annual species, is shown in figure 5, page 29.

POPPIES (PERENNIAL)

Most people are familiar with the annual poppies which have been grown in gardens since ancient times, most of these belonging to *Papaver somniferum*, the opium poppy. The shirley poppy was developed about 1880 from *Papaver rheas*, the corn poppy of Europe. The perennial poppies are not so well known as the annuals but should have a great appeal because of their permanency and excellent blooms.

The oriental poppy (*Papaver orientale*) has many colors including pink.

The Iceland poppy (*Papaver nudicaule*) is now receiving a great amount of interest, which it justly deserves. It is a true perennial, is easily grown, transplants well, and makes an excellent cut flower. There are both single and double forms and the color range is all that could be desired. The new strains have long stems and large flowers, ranging in color from white through orange, pink, yellow, chamois, and salmon rose. Coonara Pink, Gibson (orange), and Orange Gold are good examples of new varieties. The Sandford strain of England is one of the best. Plants started in the early spring will bloom by late June or the first part of July and will be well established for following years. They are best placed in the fore part of the borders in front of the taller plants. Just enough water should be applied to keep the soil moderately moist.

The rock-garden lover is interested in an excellent new blue poppy known as *Meconopsis baileyi*. This perennial is native to the high interior section of China and demands the most careful attention to get it well established. Growers have reported that it does best in a

slightly acid soil not too light in texture. Gardeners should not attempt to plant it in a light sandy loam but rather in leaf mold and peat where moisture conditions are favorable. A moist, half shady location is desirable; the poppy should not have to compete for the needed moisture. The color and good stems invite the interest of more home gardeners. Seed is now available in California seed stores.

PRIMROSE

(*Primula*)

Primulas or primroses include many species but only three or four are common in home gardens. The little *Primula malacoides* is highly valued where the winters are mild, especially for its winter and early spring bloom. Nurseries start the seed in the fall so the plants will be ready to plant out in winter and spring. Recently a large-flowered dwarf form of this species has been listed as variety Eclipse.

Primula polyantha (polyanthus primrose) includes several garden hybrids but the most popular strains have tall spikes with many flowers of good size in a wide range of color. Short stems and small size of flowers are common faults. Colors range from white to yellow, apricot, red, bronze, maroon, and even blue. There are both single and double flowers but singles are most common. Propagation is normally by seed except where some outstanding plant is to be increased; then offshoots are used, dividing the mother clump in very early spring just as soon as the soil works well.

Primula veris (cowslip) and *P. elatior* (oxslip) are occasionally grown but either short stems or small blooms make them less desirable than the best forms of *P. polyantha*, the latter species probably being made up of hybrids of several species, selected for long stems and good colors.

Primula obconica is largely limited to greenhouse culture, but it may be set out in the garden in mild weather. The flowers bloom over a rather long period of time but must be protected from cold and drouth. Drainage should be good.

Primula japonica is occasionally seen growing in home gardens under large oaks or in other shady nooks where there is plenty of moisture. The tall flower spikes bear flowers ranging from white to rose, lilac, blood-red, salmon and white striped, and white with crimson center. Moist, fertile, shaded soil is essential for success.

Primula auricula (auricula) is only occasionally seen in gardens because it is very exacting in its requirements. It requires moist soil with plenty of lime. The flowers are very showy in umbels containing as many as twenty blooms. It is valuable for the Alpine rock garden.

PYRETHRUM

(*Chrysanthemum coccineum*)

Visitors at recent flower shows have marveled at the hybrid pyrethrums now being raised. The daisy-like flowers range in color from rose to pink, cream, and white. The flowers come in either singles or doubles, the latter only coming partly double from seed. The flowers are very good for house decoration. A heavy fertile loam soil produces excellent flowers and for those wanting a hardy spring-blooming aster-like flower it would be hard to make a better selection for many California districts. The small golden feather (*Chrysanthemum parthenium*) often seen in borders should not be confused with *Chrysanthemum coccineum* (*Pyrethrum roseum*, *Pyrethrum hybridum*). Persian insect powder is made from still another species.

SALVIA (FLOWERING SAGE)

Most people think of the scarlet sage (*Salvia splendens*) when the word 'salvia' is used. This rather tender perennial has been used extensively, especially further east, but in California other species are perhaps more popular. *Salvia leucantha*, or purple sage, is a very hardy and vigorous sage. The flowers are purple with white tips. *Salvia nemorosa* has small flowers of violet or purple or bronze-purple and the plant is similar in habit to the purple sage. *Salvia azurea* is native to the southern states and is normally blue. *Salvia pitcheri*, var. *angustifolia*, has been grouped under *Salvia azurea* by F. T. Hubbard. *Salvia farinacea* is another perennial salvia with light-blue flowers valuable for cutting. Still other salvias are being grown, and the United States Department of Agriculture has distributed new species from China for further testing as ornamentals.

Most of the salvias seem to thrive under California conditions and the fact that California has many hardy native perennial sages would suggest their success in a semi-arid climate. However, most of the salvias respond to irrigation. They have no serious pests or diseases as a rule, although garden plants have been killed by a soil fungus attacking at the soil surface under heavy irrigation. The salvias should not be overwatered.

VIOLET

(Viola odorata)

Outdoor violet culture has been common among commercial growers in California but is not so important in home gardens. Excessive shade, the attacks of certain pests like red spider, and poor varieties have discouraged many gardeners from growing violets. However, violets are desirable when they can be given a suitable location and proper care. Violets like a cool climate such as prevails near the coast in southern and central California. Enough heat for good growth is essential but in the hot climates it will be necessary to plant where shade is available. Violets like a loose, fertile soil, well supplied with moisture. Red spiders do not thrive where there is considerable moisture but readily attack weakly growing plants during the dry season. A general clean-up of old foliage and other plants which harbor red spiders may be needed to insure control.

The most popular varieties of violets include the following, in order of importance :

Princess of Wales, the largest and best single, with long stems and light-purple flowers, fragrant; considered a type of the California variety; suited to coast districts.

California, very productive, single, dark violet-blue; does not fade; has long stems well above the foliage; subject to red spider; less popular than Princess of Wales.

Marie Louise, double, lavender-blue, fragrant, long stems, good foliage; does well away from coast in sandy loam soil.

Purple King, has a profusion of blooms medium in size, single, keep well.

President Herrick, new, dark violet, fragrant, heavy foliage.

Swanley White, the leading double white; does well inland in sandy loam soil.

Violets are best propagated from runners early in the spring because the plants produced from these early runners are least affected by disease. Offshoots can be used but are not as desirable. Seedlings are variable in their characteristics.

HINTS ON GROWING SOME OF THE POPULAR GARDEN BULBS AND ROOTS²⁴

DAHLIA²⁵

The dahlia originally came from Mexico but probably finds no more congenial home anywhere in the world than near the coast in California. Many excellent varieties have been developed in California, and the many dahlia shows held each year demonstrate that size, form, color, and perfection of blooms are all wonderful. But cultural perfection depends very largely on having a cool moist climate with fertile soil. Heat or poor soil causes trouble. Plenty of irrigation water will in part overcome a hot dry sun, but only a few varieties will really be satisfactory in a very hot, dry climate.

Dahlia varieties are being developed which keep well when cut. The small Pompon dahlias (fig. 20) have been used for home decoration and are widely sold by florists. Certain long-keeping, large-flowered varieties are being handled more and more, though there will always be limitations; few dahlias will keep longer than three days even with the best care. Persons who wish to select varieties that keep well should consult expert dahlia growers.

Over 7,000 varieties of dahlias have been listed in catalogs; any list suggested here must be more or less arbitrary, yet the need for such information is all the greater. Experience over a long period has demonstrated the value of certain classes and varieties. The home gardener is primarily interested in flowers effective in giving a good garden display and suitable for home decoration. For these purposes the commercial large-flowered varieties and the Pompons and Singles are most satisfactory. As he becomes interested in the fancy side, other varieties that do not keep so well or that are more exacting in their cultural requirements may be added to the collection.

Dahlia varieties come in several types. In order of popularity these may be listed as:

1. Decorative: flat petals clear to the center of the flower; range in size from 6 to 10 inches, occasionally reaching 14 inches in diameter; excellent for garden display.

²⁴ Includes those plants normally started from bulbs, underground rootstocks, or fleshy roots.

²⁵ See also: Morrison, B. Y. Dahlias for the home. U. S. Dept. Agr. Farmers' Bul. 1370:1-16. 1923.

2. Hybrid Cactus: flattened, twisted, pointed petals clear to center; flowers very large; excellent for garden display.
3. Cactus: rolled, pointed petals clear to the center; stems often rather weak at the neck; very good for garden display; good keepers.
4. Pompons: miniature dahlias usually coming in quilled form with dense rounded heads; recently Decorative Pompons have been added to this group; very good keepers but less effective in the garden.



Fig. 20.—The Pompon dahlia is extensively used as a cut flower in California homes. The plants thrive in most gardens where plenty of moisture is available and certain insect pests can be controlled.

5. Peony: large flat petals with about three rows and yellow round center of flower showing; very good for garden display; but not very good keepers. A few Decoratives may be Peony in one place and Decorative in another.
6. Single: the large Singles and small Singles are available; the small Singles, known as English Singles, are most popular and excellent for bedding, also valuable along with Pompons in home decoration.
7. Show: flowers in round heads with quilled petals. The hybrid Show has more flattened petals but is still slightly quilled. Most Pompons are miniatures of the Show type. Show dahlias are largely limited to exhibition.

8. Collarette: like the Single, there should be eight petals around the edge but in addition there is a collar of three small petals opposite each of the eight ray petals; an exhibition flower mostly.
9. Anemone: a Single-type dahlia with disk flowers in center raised in the form of tubular petals; not common or popular.

Occasionally other classes are mentioned. The Fancy has bicolored flowers but this classification is seldom mentioned now except in describing varieties.

For the benefit of the beginner, a few popular varieties of proved merit are listed below. Many other equally fine varieties may be had from leading dahlia growers.

Large dahlias

Ambassador—amber; Hybrid Cactus
Eleanor Martin—mulberry-suffused old-gold; Decorative
Edna Ferber—coral to old-gold; Hybrid Cactus
El Granada—orange with yellow reverse; Hybrid Cactus
Elinor Vandevceer—rose-pink; Decorative
Gladys Bates—early; amber; Cactus
Gladys Champion—apricot with red on reverse; Peony
Islam Patrol—scarlet-tipped old-gold; Decorative
Jane Cowl—buff; Decorative
Jersey's Beauty—salmon-pink; Decorative
Marmion—apricot; Decorative
Mrs. Alfred B. Seal—old-rose; Decorative
Mrs. Carl Salbach—lavender-pink; Decorative
Mrs. Edna Spencer—lavender-pink; Cactus
Nobilis—red and white; Decorative
Pierrot—amber-tipped white; Cactus
Pride of California—red; Decorative
Regent—pink; Cactus
Tommy Atkins—scarlet-red; Decorative

Small dahlias (Pompons and Singles)

Aimee—bronze; Pompon
Darkest of All—deep maroon; Pompon
Gertrude—carmine-red; Pompon
Girle—rosy-lilac; Pompon
Glow—old-rose; Pompon
Helen Anita—lavender with light center; Pompon
Joe Fette—white; Pompon
Johnny—deep maroon-red; Pompon
Little Beeswing—yellow petals tipped red; Pompon
Little David—orange; Pompon
Little Jewell—pink; miniature Decorative
Mrs. Joynson Hicks—buff with maroon ring; English Single
Naranja—orange; English Single
Yellow Gem—yellow; Pompon

The soil should be prepared well in advance of planting and should be fertilized with well-rotted cow manure if this is deemed necessary. At planting time in April or May it is best to set a stake where the dahlia hill is to be and plant one tuber next to the stake; $2\frac{1}{2}$ feet is a good distance for planting provided an extra 1 to $1\frac{1}{2}$ feet is left every second row to give room for a path.

The tuber is planted flat at a depth of 4 to 6 inches with the bud against the stake and pointing up. It is desirable to plant shallower in very heavy soil than in sandy soil. Each variety should be tagged at the time of planting.

Irrigation is not likely to be needed until the tubers are up, but water may be given if the soil should become dry. Water may be needed once or twice a week during the growing season and possibly oftener during heavy bloom later on. Some growers endeavor to water the night before picking.

Barnyard manure may be applied around each hill when the first buds appear. Well-rotted cow manure and even fresh horse manure have given good results. If a manure mulch is placed in a shallow basin further cultivation will rarely be needed during the rest of the season.

It is advisable to spray once a week with a 40 per cent nicotine sulfate spray to control aphids and thrips. Wireworms in tubers may be controlled with calcium cyanide dust. Diabrotica or green beetle is controlled by hand picking or by screening the exhibition blooms.

Mildew, stem spot, and stunt or mosaic disease are the three most common troubles of growing plants. Rotation and the planting of clean tubers are about the only effective control measures yet devised for dahlia stunt. Little is known about the cause of stem spot. Root rot is largely a storage difficulty and is most easily controlled by leaving the tubers in the ground over winter if the soil is well drained and does not freeze. The gardener should avoid immature tubers and should not permit the tubers in storage to dry out excessively. It is never advisable to plant a tuber suspected of having nematode worms, a knotty appearance being an outward indication of these parasites.

In digging dahlias the grower should avoid breaking the necks of the tubers by placing the hand underneath the clump when lifting out the tubers. The clump should be allowed to dry off some before storing and should be stored in drygoods boxes where the temperature is close to 55° Fahrenheit and not too dry. Mill shavings have been used for covering the stored tubers.

All side buds should be removed from the stem if large exhibition blooms are desired. At least one to three buds are removed below the bud saved in such a case.

Dahlia flowers keep best when they are picked in the early morning and the stems dipped in scalding water. Mature flowers that are not too old keep best. A cool temperature is the most important single factor in keeping flowers. High humidity and good ventilation are also important. Cracked ice placed in the containers will aid during exhibitions. As much of the foliage as possible should be removed to prevent excessive evaporation of moisture. No chemical of any kind has been found to aid in keeping flowers after cutting. Many chemicals are very injurious.

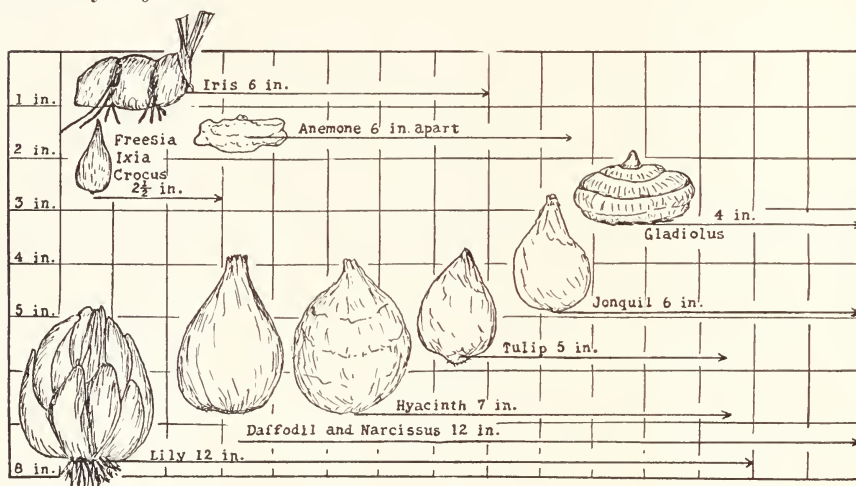


Fig. 21.—Diagram to show proper depth of planting bulbs, indicated by the figures at the left; and distance apart in the row, indicated by the line at the right of each bulb.

FREESIA AND SIMILAR CAPE BULBS

The freesia is best known of the Cape bulbs, but there is increasing interest in the *Babiana*, *Ixia*, *Lapeirousia*, *Sparaxis*, and *Tritonia*. All will have about the same cultural methods as the freesia. For depth of planting bulbs see figure 21.

The bulbs should be planted in the fall before winter rains set in, usually from August to the end of November. They may be planted either in rows, or in masses where the drainage is good, and in full sun.

Commercial freesia bulbs are graded in about nine grades, ranging in size from $\frac{1}{4}$ inch to over 1 inch. The larger bulbs, from $\frac{5}{8}$ inch to an inch or more in diameter, will produce the best cut flowers. Small bulbs can be planted for increase.

Many new varieties of freesias have been added recently. Purity is still standard in white. Other colors include Carrie Budau in lavender-pink, General Pershing in yellow and pink, Olivette in bright carmine, and Splendens in lavender-violet.

Improvements have been made in the other Cape bulbs. *Lapeirousia cruenta* (flame freesia), *Sparaxis tricolor* and *Sparaxis grandiflora*, *Ixias* in pink and green, *Tritonia crocata*, and large-flowered montbretias are just a few of these.



Fig. 22.—The Primulinus hybrid with its butterfly shape has been a welcome member of the gladiolus family. It is greatly valued as a cut flower for the home. The variety shown is Orange Butterfly. (Photograph by courtesy of Carl Salbach.)

GLADIOLUS

California growing conditions are much like those of South Africa, from which come the several species that gave rise to the modern gladiolus. Probably this accounts for the fact that the early-flowering Nanus and Colvillei types, as well as the large late-flowering varieties, can be grown in the state. Some of the many wild species are being tested out and there is promise of a happy home here. But the present

interest is mostly centered in the large-flowered gladiolus and the *Primulinus* hybrids (fig. 22). Over a dozen wild species have been used in producing the many varieties of modern gladiolus and the possibilities are not yet exhausted, especially in the shape of the flowers. California will have to do most of this breeding work because only the southwestern part of the United States has a climate suited to some promising species; they cannot stand freezing weather and should have a long rest after they are through blooming. A climate with summer rains is unfavorable.

The early-flowering gladiolus is best known by such varieties as the Bride, Peach Blossom, Blushing Bride, Apollo, Brilliant, Crimson Queen, and Rubrum. The Bride is the small white gladiolus often sold by florists for Memorial Day. It is very hardy and easy to grow. Peach Blossom, in pink, is more difficult. All of these early gladiolus should be lifted and replanted in the fall each year. Apparently the fungus troubles which attack the bulbs left in the ground are closely associated with poor drainage, and just the lifting and the digging over of the soil will largely eliminate the trouble. Early gladiolus should be planted just before the first fall rains come.

Under glass the large or late-flowered gladiolus may be planted any time from fall to spring, but in outside gardens it is safest to delay planting in home gardens until good growing weather comes in the spring. The soil works well at that time, and good preparation of the soil will last much longer than the same preparation in fall. Heavy soils are very unfavorable to fall planting because the rain compacts them so much that growth is poor. February to May is a suitable period for planting because all frosts are over by the time the bulbs are up.

A few popular varieties are listed below, though many others of equal value might be selected. New varieties are not listed except where they have very outstanding merit.

Large-flowered gladiolus varieties

Red shades

Crimson Glow
Dr. F. E. Bennett
Improved Martha Washington
O. D. Baldwin
Pfitzer's Triumph
Purple Glory
Scarlet Wonder
Virginia (Scarlet Princeps)

White predominating

Coronado
Diener's White (Polar Star)

Helen Wills

White Giant

Orange, apricot, salmon varieties

Betty Nuthall
Emile Aubrun
Nancy Hanks
Orange Wonder
Senorita

Golden or cream varieties

Claremont
Golden Dream
Golden Measure
Sydney Plummer

Blues, lavenders, lilacs, purples

violets—

Anna Eberius
 Baron Hulot
 Dr. Moody
 Geraldine Farrar
 Heavenly Blue
 Marmora
 Minuet
 Mrs. Van Konynenburg
 Muriel
 Paul Pfitzer
 Rose Ash

Various pink varieties

Anthony B. Kunderd
 Break O'Day
 Byron L. Smith
 Catherine Coleman
 Col. Chas. Lindbergh
 Coryphee
 Early Sunrise
 Evelyn Kirkland
 Frank M. Schick

Freda

Gertrude Errey
 Giant Nymph
 Halley
 Helen Jacobs
 Le Marechal Foch
 Los Angeles
 Marietta
 Mrs. Dr. Norton
 Mrs. Frank Pendleton
 Mrs. Francis King
 Mrs. John Wood (Leon A.
 Douglas similar)
 Mrs. P. W. Sisson
 Mrs. T. Rattray
 Myrtle
 Pearl of California
 Prince of Wales
 Richard Diener
 Salbach's Orchid
 Salbach's Pink
 Superba
 W. H. Phipps
 William Kent

Primulinus hybrids

Ada De Poy—apricot
 Alice Tiplady—orange saffron
 Apricot Glow
 Arden—watermelon red
 Baby Mine—pink
 Golden Amber
 La Paloma—orange
 Miss California—pink
 Mission Bells—pink

Mrs. Calvin Coolidge—salmon rose-
 pink
 Myra—deep salmon
 Orange Queen—orange
 Orange Butterfly—orange
 Salmon Beauty—deep salmon
 Shell Pink
 Scarlet Bedder
 Souvenir—yellow
 Zenobia—orange red

Gladiolus corms (bulbs) are sold according to size—small, medium, and large—or else according to diameter, as: No. 1, $1\frac{1}{2}$ inches up; No. 2, $1\frac{1}{4}$ to $1\frac{1}{2}$ inches; No. 3, 1 to $1\frac{1}{4}$ inches; No. 4, $\frac{3}{4}$ to 1 inch; No. 5, $\frac{1}{4}$ to $\frac{3}{4}$ inch; No. 6, $\frac{1}{4}$ inch or less; and bulblets or cormels. Grades 1 to 3 and sometimes smaller will usually bloom the first year. The very small bulbs either do not bloom the first year or make a very small spike. High-crown bulbs are preferred because they send up the best flower spikes. Very large flat bulbs will divide and send up two or three smaller spikes.

In home gardens the corms may be planted here and there in available spaces where proper irrigation and cultivation can be given. Many gardeners want most of the bloom in June and July and a few late blooms in August. The early-flowering gladiolus will be through bloom in June in most parts of California. If large beds are to be planted, then regular rows should be used to make the work easier. A distance of 4 to 6 inches apart in the row and rows far

enough apart to permit irrigation and hand cultivation will be about right. Small bulbs and bulblets for increase are scattered in rows like peas. Large bulbs should be set 3 or 4 inches deep, but small bulbs and bulblets should be only 1 or 1½ inches deep, the greater depth being allowed for light sandy soils. The measurement is made from the surface of the ground and not from the top of the furrow.

A loose sandy loam soil is easiest to manage but needs plenty of organic matter. Fertilizing should not be done at planting time. Excessive fertilizing will injure the keeping qualities of the bulbs, and large amounts of barnyard manure favor some of the fungus diseases which attack the gladiolus. Gladiolus do best in a soil that is fairly moist, yet well drained. Overhead irrigation is entirely satisfactory in every way, but furrow irrigation is also used by some gardeners. Irregular moisture supply may result in crooked stems or stunted plants. Cultivate only enough to keep weeds down and to loosen the soil so that water will soak down readily.

Support for gladiolus is not ordinarily essential but spikes that are 5 feet tall or higher may be blown over, especially while the soil is very wet, unless they are staked. Setting the corms fairly deep will help to prevent falling. Plant before the bulbs have sprouted badly.

Serious diseases of the gladiolus include scab, storage rots, and mosaic, or yellows. Scab is characterized by small pits on the outside of the corm. The storage rots or dry rots appear as darkened areas on part or all of the corm and usually render it unfit for planting. If the disease appears during the growing season the outside leaves start to turn yellow and in some cases the plant dies. Rotation of the bulbs to new soil each year is essential for complete success in preventing these diseases. True, certain hardy varieties seem to live in the same soil for many years, sometimes without lifting during winter, but many varieties will gradually disappear with such treatment. Digging each year, sorting out all inferior corms, dipping in a good disinfecting solution shortly before planting, and yearly rotation will be most likely to keep down all serious disease. The bulbs should be peeled and dipped in 2 to 4 per cent lime-sulfur solution heated to 125° F for ½ minute or else in a solution of 1 part formaldehyde to 120 parts unheated water for 30 minutes. If the bulbs are not wet thoroughly before dipping, it will take a little longer to be sure of complete disinfection with the formaldehyde. Corrosive sublimate (mercuric chloride) is used at a strength of 1 part to 1,000 parts unheated water for 1½ hours. Any treatment that does not involve changing from infected soil will not be likely to prove effective. Mosaic disease or

yellows, indicated by water-soaked blotches on the petals, is only controlled by roguing out every diseased bulb and bulblet.

Insects, particularly the mealybug and aphids, also attack gladiolus corms. These two pests are serious in storage, and mealybugs may remain on the corms or the growing stems all season unless killed in some way. Calcium cyanide is most promising for controlling mealybugs that attack flowering plants just beneath the soil surface. Either the dust or the crystals may be used. But if the bulbs are cleaned up by dipping before they are planted, they will have a fair start. Gladiolus bulbs should be dug after the leaves have turned yellow, then dried where they will not be sunburned. The tops should be cut off after they dry and the corms stored in shallow, wire-bottom trays, not more than one or two layers deep. Good ventilation is essential for successful storage. The bulblets may be saved if the variety is valuable; later during the winter these bulblets may be cleaned by first washing and then separating from clods and gravel with the aid of a shallow tray. Small holes cut in the corner of the tray will allow the bulblet to roll out into a container while the gravel and clods or chaff will be left behind.

At least four healthy leaves should be left at the base when gladiolus blooms are cut, so that the bulb may store up enough reserve food material for good blooms another season. If the flower stalk is cut too low next year's crop of bloom may be injured.

The pleasure in gladiolus in home gardens is often increased by growing properly named varieties of merit. These are not necessarily expensive, though the newer sorts usually sell for 25 cents to a dollar a corm, sometimes much more. Great improvements are being made in height, color, number of blooms open at a time, and facing to one plane. The flower shows will give an excellent idea of accomplishments. The butterfly shape and the pleasing colors in the *Primulinus* hybrids are very interesting. The large *Grandiflora Primulinus* retains the curved upper lip but in size is more like the ordinary large gladiolus. Inferior gladiolus should gradually be replaced with improved varieties. Clean, healthy bulbs should be used, and any bulbs that should become diseased should be sorted out. Any variety that is untrue to name may be relabeled and separated at digging time, or if not wanted discarded at once.

IRIS²⁶

Many home gardeners consider the modern iris their favorite flower. Irises thrive with a minimum amount of care, and many varieties do well on soil that will not grow exacting flowers. However, irises will respond to good care. The Japanese irises like a wet muck soil that is acid. *Iris susiana* will not thrive except in a few districts where winter drainage is good and the plants have a rest in summer. The bulbous iris is harder to grow and obtain good blooms from than the common iris. Tall irises with *Iris mesopotamica* blood are exceedingly popular. Some of the nonbearded irises are grown, among which might be mentioned *Iris orientalis* (ochroleuca), *I. aurea*, *I. monnieri*, *I. spuria*, *I. unguicularis* (*I. stylosa* or winter iris), *I. sibirica* (Siberian iris), and *I. levigata* (Japanese iris). Some of the native iris species are grown by fanciers. The Spanish and Dutch irises (*I. xiphium* and *I. xiphium* hybrids) are grown from bulbs.²⁷ The Dutch is a little hardier and two weeks earlier than the Spanish and for this reason may be given preference. The English iris (*I. xiphioides*) has bulbs also and needs wet soil. People wanting irises around wet pools might consider three species, the Japanese, Siberian, and the yellow English species, *Iris pseudacorus*. Many other interesting species will be found in California iris gardens.

Bearded iris come in tall (fig. 23), intermediate, and short (pumila) varieties. There are several color groupings, and a choice will depend very largely on personal tastes, though some varieties are universally popular. Some of the more popular iris varieties are listed below: a few of the best new varieties are included, even though these may be expensive for the next few seasons. Iris dealers will gladly supply catalogs listing these and many other fine varieties.

Tall bearded iris varieties that should remain popular for many years

Aleazar—mauve and purple; midseason
Ambassadeur—bronzy violet and velvety maroon; late
Asia—lavender on gold base; late
Avalon—pinkish lavender; midseason
Ballerine—blue violet; midseason
Fortuna—variegata with yellow prevailing; midseason
Frieda Mohr—pinkish lavender; midseason to late
Grace Sturtevant—dark red-brown prevailing; midseason
Lent A. Williamson—lavender and pansy violet; midseason

²⁶ See also: Morrison, B. Y. Garden irises. U. S. Dept. Agr. Farmers' Bul. 1406:1-46. 1926.

²⁷ For further information see: Griffiths, David. Production of certain iris bulbs. U. S. Dept. Agr. Cir. 25:1-22. 7 plates. 1928.

Los Angeles—white edged pale blue; midseason
 Mme. Cheri—violet tinted pink with yellow undertone; midseason
 Mme. Durrand—buff flushed lilac and amber; midseason
 Mme. Gaudichau—violet and dark purple; midseason
 Modoc—almost black; midseason
 Mrs. Valerie West—lavender with bronze and crimson brown; midseason
 Princess Beatrice—light lavender; midseason
 Purissima—the best white for California; midseason
 San Gabriel—pinkish lavender; early
 San Francisco—white edged lavender; midseason
 Santa Barbara—lavender-blue; midseason
 Shasta—hardy white; midseason
 Sir Michael—lavender-blue and purple-garnet; midseason



Fig. 23.—The tall bearded irises are best known and easiest to grow. California conditions are most favorable for the growing of this group of irises in home gardens. (Photograph by courtesy of Carl Salbach.)

Iris of only medium height but popular for home gardens

Dream—crinkled rose pink
 Iris King—yellow and velvety garnet; midseason
 Mildred Presby—white, lavender, and pansy violet
 Ramona—petunia violet and cinnamon brown
 Rialgar—buttercup yellow striped bronze
 Seminole—velvety red-purple
 Shekinah—lemon yellow
 Stipples—white with bluish violet stippling
 Sweet Lavender—lavender violet and rosy lavender
 William Mohr—an odd hybrid, pale lilac veined manganese violet

Regelia and related hybrids (suitable for California, where drainage is good and the winter not too cold and wet)

Bellorio—lavender mouse-gray
 Carmelo—unusual shade of blue

Charon—bronzy mahogany veined gold and brown

Hoogiana—blue

Saturn—gray veined purple

Stolonifera—bronze brown and steel blue

Turkoman—brown, violet, purple, and blue shades

Bulbous iris of proved merit

Imperator—dark blue; *Iris filifolia* variety

Wedgewood—light blue; *Iris tingitania* variety

Cajanus—yellow; Spanish variety

Hart Nibbrig—bright blue; Dutch variety

J. W. de Wilde—yellow with bronze sheen; Dutch variety

White Excelsior—white; Dutch variety

Siberian iris

Emperor—deep violet

Perry's Blue—tall, light blue

Iris spuria (includes Monspur hybrids)

A. J. Balfour—tall beardless blue

Lord Woolsey—tall beardless blue

Monneri—tall beardless yellow. Aurea is a deeper yellow species

Ochroleuca—tall beardless white, falls with a little yellow

Iris unguicularis (stylosa)—the winter-blooming iris

LILIES²⁸

California has a large number of native lily species and several of the Asiatic species have found a congenial home here. Lilies need a well-drained, fertile, moist, neutral or slightly acid soil, with an abundance of organic matter. The soil should be free from soil fungi that cause bulb rot; new soil is preferable if it can be secured. If new soil is put in, a little sand or leaf mold in the bottom of the hole will help to insure good drainage. German peat can be worked into the soil to aid drainage. Most lilies do best with partial shade, as found on the north side of buildings or where large plants provide some shade during the hot afternoons. The regal lily (fig. 24) and *Lilium henryi* will tolerate full sun but even these do well with partial shade.

Lilies vary considerably in their habits of rooting and growth. The wild California leopard lily (*Lilium pardalinum*) has a creeping bulb and is very hardy, only requiring dividing when the bulbs crowd each other. The gold-banded lily (*Lilium auratum*) rarely does well because in many cases roots form only on the stem above the bulbs, whereas the formation of roots beneath the bulb is essential for continued growth year after year. *Lilium speciosum rubrum* and its relatives are a little more hardy because roots are formed both above and beneath the bulbs without much trouble. The regal lily and *Lilium*

²⁸ See: Griffiths, David. Score of easily propagated lilies. U. S. Dept. Agr. Cir. 23:1-35. 19 fig. 1928. Also: Griffiths, David. The regal lily. U. S. Dept. Agr. Dept. Bul. 1459:1-8. 4 plates. 1926.

henryi form large bulbs in many parts of California without any special attention on the part of the grower and are perhaps the two most satisfactory home-garden lilies. For gardens that are well adapted to lily culture many other beautiful species of lilies are available, such as *Lilium testaceum* (Nankeen lily), *Lilium thunbergianum* (*elegans*), *Lilium tigrinum* (single and double tiger lilies), and *Lilium umbellatum*, and also the best natives such as *Lilium washingtonianum* and *Lilium pardalinum*. The common Easter lily (*Lilium longiflorum*



Fig. 24.—The Regal lily (*Lilium regale*) is perhaps the best garden lily of the Easter lily group, because of its extreme vigor and hardiness with a minimum amount of attention. Plants shown are two years from seed. (Photograph by courtesy of Western Homes and Gardens.)

and its varieties) is not especially adapted to most California home gardens, although it can be grown. *Lilium philippinense* does not overwinter as well as the hardy lilies but is excellent in a mild climate with good drainage. *Lilium candidum* (madonna lily) is still grown in some home gardens because it is one of the hardiest white lilies.

Lily bulbs should be large in size to bloom well. Bulbs imported from Japan (as *Lilium auratum* and *L. speciosum*) have to be dug early in order to arrive in California by Christmas. In some cases the bulbs may be immature and shriveled. Such bulbs cannot produce the best blooms and may take several years to recuperate. The same is

true of bulbs which have been forced in hothouses. Gardeners should try to get plump, mature, large bulbs with uninjured bulb scales. It is important to examine the buds in the center of the bulb. A large bulb may have two or more small buds; these will not give as satisfactory bloom as a somewhat smaller bulb with one large vigorous bud. The newly formed buds that are to develop into the new flower spike will be pointed with tightly clasping scales. A group of loose, open scales indicates where the previous year's flower stalk arose. The grower should try to get the bulbs just as soon as they are available in the fall, as early as November if possible. These early-planted bulbs form the best root system and are most likely to become established. If for any reason highly desired bulbs should fail to become established in a home garden, success may be had by planting seed and developing the seedlings; thus the moving of large bulbs will be avoided. Most lilies will bloom in two to three years from seed in California if given good care.

Lilies are sometimes attacked by fungi that either rot the bulb or the flower stem. No satisfactory control is available except to provide good drainage and virgin soil, if possible. Sterilizing the soil about the bulbs at planting time may help to avoid trouble.

Certain aphids (plant lice) attack the growing lily plants but may easily be controlled by 40 per cent nicotine sulfate, the usual tobacco preparation on the market. A yellowing of the lily leaves is often a sign of too little watering or of poor drainage. Lily bulbs should be planted 6 to 8 inches deep at least and then watered so the soil will be thoroughly wet. Young bulbs should be set deeper after the first year or two. Deep-planted bulbs will be least troubled about lack of moisture. Mulching the bulbs with leaf mold or German peat will help to keep the soil moist and cool. If any fertilizer other than leaf mold is added a slightly acid one like ammonium sulfate may be applied sparingly through the mulch.

Tall lilies should be staked so that there will be no breakage.

Gardeners should not expect small lily bulbs to make good flower spikes. Some of the small bulbs sold at a low price may produce only one flower or none at all the first season. It is safer to buy from producers when possible.

NARCISSUS AND DAFFODIL²⁹

Several kinds of spring of spring bulbs are included under the name narcissus. 'China' lilies, Paper White narcissus, daffodils, jonquils, poeticus, bulbocodiums, and other horticultural groups come under the heading. All have similar cultural requirements and similar pests and diseases.



Fig. 25.—The daffodil is a popular representative of the spring bulbs. Home gardeners in this country still fail to attach as much importance to this fine flowering bulb as do English gardeners, but interest is increasing rapidly. (Photograph by courtesy of Hallawell Seed Co.)

A fertile, well-drained, moist soil encourages good growth. Full sun is desirable. Bulbs may fail to bloom well when they have to

²⁹ For reference see: Griffiths, David. Production of narcissus bulbs. U. S. Dept. Agr. Dept. Bul. 1270:1-31. 9 plates. 1924.

compete with shrubs and other plants for plant food, moisture, and light. Most of these bulbs will need to be divided about once every four or five years after they become crowded. After the bulbs have bloomed, their green leaves may be braided to keep them out of the way, but they should not be cut off nor the bulbs dug until the leaves have turned yellow, because the bulbs will not be able to ripen next year's blooms unless they are allowed to store up food material.

Narcissus bulbs have a few serious pests—the greater and lesser bulb flies and the stem nematode. Quarantine measures against these pests are in force and only healthy bulbs have a legal right to be shipped. All bulbs should go through the hot-water dipping process, or 'cooking' as the bulb growers call it.³⁰ Water is raised to about 115° F and the bulbs are held in it for about 3 hours, which is long enough to kill all the larvae and eggs of the bulb flies or the nematode. Home treatment of bulbs is not practical because it is nearly impossible to keep a uniform temperature without the proper equipment, but if only healthy bulbs are purchased in the beginning and all diseased or unsound bulbs are discarded, the home garden can be kept fairly clean.

A list of a few well-known narcissus varieties will help the beginner to make a good start with this excellent group of spring-flowering bulbs. The bulbs should be bought in time to plant before the spring rains start. Late-planted bulbs will grow, but they do not develop as good a root system the first season as the bulbs planted from September to November.

Narcissus pseudo-narcissus—large trumpet daffodils (fig. 25)

Emperor	}	yellow
Golden Spur		
King Alfred		
Van Waveren's Giant		
Mme. De Graff	}	white
Mrs. E. H. Krelage		
Beersheba (for future)		
Duke of Bedford	}	bicolor
Empress		
Spring Glory		

Narcissus incomparabilis—large chalice-cupped daffodils

(long trumpet daffodil x *Narcissus poeticus*)

Sir Watkin
Bernardino
Glori Mundi
Croesus

³⁰ See also: Griffiths, David. Experiments with hot-water treatment of daffodils in relation to forcing and field culture. U. S. Dept. Agr. Cir. 113:1-36. 18 figs. 1930.

Narcissus barrii—small chalice-cupped or star daffodil (*Narcissus incomparabilis* x *N. poeticus*)

Barrii Conspicuous
Bath's Flame
Firetail
Seagull

Narcissus leedsii—(silver-winged daffodils; white or pale yellow with pointed petals (white trumpet x *Narcissus poeticus*)

White Lady
Lord Kitchener
Mitylene
Tenedos

Narcissus triandrus hybrids—cyclamen-flowered daffodils

Narcissus triandrus var. *albus*—Angel's Tears

Narcissus jonquilla, *N. odoratus*, and hybrids—jonquils

Campernelle
Buttercup, a hybrid
Golden Scepter, a hybrid

Narcissus tazetta—polyanthus narcissus

N. tazetta var. *papyraceus* (paper-white narcissus)

N. tazetta orientalis (China lily)

Soleil d'Or
Grand Monarque

Narcissus poetaz—hardy cluster-flowered daffodils (*Narcissus tazetta* x *N. poeticus*)

Admiration
Orange Cup

Narcissus poeticus—poet's narcissus; pure white perianth

Epic
Recurvus (Pheasant's Eye)
Horace (early)
Sonata (late)

Double varieties

Alba plena odorata (*Narcissus poeticus* variety)
Orange Phoenix (daffodil)
Primrose Phoenix (daffodil)

Miscellaneous

Narcissus bulbocodium (yellow hoop-petticoat daffodil)

Narcissus bulbocodium var. *monophyllus* (*N. Clusii*) (white hoop-petticoat daffodil)

TULIP

(*Tulipa*)³¹

Tulips have their place among the spring-flowering bulbs and with right varieties properly grown will last for many years. California-grown tulips do not usually reach as large a size as the imported Holland bulbs but the bulbs are firm and bloom very well if

³¹ For bulb production see: Griffiths, David. Production of tulip bulbs. U. S. Dept. Ag. Bul. 1082:1-48. 20 plates. 1922.

given enough water during the late spring and summer to ripen the bulbs for next year's bloom. A failure to have the bulbs mature will tend to result in blind bulbs and a rapid deterioration in the size of the bulbs. The gardener should either plan to take reasonable care of the tulips or should leave them out. They will not stand neglect. If the bulbs are in the way after blooming it is possible to lift the plants and heel them in out of the way until the bulbs mature. The bulbs should not be dug for storage until after the leaves have started to turn yellow.

Tulips need a fertile, well-drained soil, with plenty of organic matter, and they should have an abundant supply of moisture. Holland bulbs are often subirrigated.

Tulips are affected with a virus disease which results in 'broken colors'. This 'breaking of tulips' has been known for 300 years but only recently was the cause associated with a specific organism. The Oregon Agricultural Experiment Station has demonstrated that it is a mosaic disease readily spread to healthy plants by means of aphids. Rembrandts, Cottage, Breeders, and Darwins have all been infected.³² Roguing (or weeding out diseased plants) along with insect control is therefore very important in reducing the amount of disease.

Tulip fire, due to a fungus (*Botrytis tulipae*), is carried through the bulb and in the soil. Disinfecting the bulbs may help but they should be planted in new, clean ground, for treating alone is apparently not sufficient for control.

Aphids may be controlled in storage by dusting with nicodust and in the field by spraying with 40 per cent nicotine sulfate.

The few tulip varieties listed below are selected from the several classes as representative of the many popular sorts in cultivation. Those named illustrate tulips which have proved their value under California conditions.

Darwins—tall stems, globular flowers, in a wide range of colors

Clara Butt—pink

Dream—lilac

Pride of Haarlem—rosy carmine

Rev. Ewbank—lilac

Cottage—not quite as tall as the Darwins but very popular; come in certain colors and forms not found in the other

Inglescombe Pink

Inglescombe Yellow

Orange King

³² See: Oregon Agricultural Experiment Station. Bulb diseases. Oregon Agr. Exp. Sta. Ann. Report 1926-28. p. 98. 1928.

Breeders—tall, strong growth, large flowers, but in a different range of colors than the Darwins

Bronze King

Bronze Queen

Cardinal Manning—wine-red, flushed brown

Prince of Orange—terra cotta and orange

Lily-flowered tulips—a cross of Darwins with *Tulipa retroflexa*; petals pointed and often reflexed

Adonis—rosy red

Artemis—carmine-rose

Sirene—rose

Species for rock gardens:

Clusiana—carmine-rose bordered white

Kaufmanniana—sulfur yellow

WATER LILY

With the increase of interest in outside pools in California home gardeners are asking for more information on water lilies. Experience has been lacking in many localities, but probably a dozen growers of water lilies, mostly in Los Angeles County, are making large sales and have had some reports on results. The hardy water lilies (*Nymphaea* species) have done well in all parts of California where they were given plenty of fertile soil and room in which to grow. Some of the tropical water lilies have given success even outside of the mild sections of southern California. A very brief list of popular *Nymphaea* varieties follows:

Hardy varieties

Attraction—garnet-red to crimson

Comanche—copper or apricot

Conqueror—crimson

Escarboucle—red

Formosa—La France pink

Gladstone—white

Gloriosa—red

Mansaniello—pink

Marliac group—pink, white, red, and yellow varieties

Paul Hariot—yellow suffused pink

Pygmaca Helvola (*N. tetragona* var. *helvola*)—dwarf yellow for miniature pools

Somptuosa—pink

Splendida—strawberry-pink

Sunrise—yellow

Tropical varieties

For mild climate

Blue Triumph

General Pershing—pink

George Huster—ruby red; night-blooming

Mrs. C. W. Ward—rose pink

Mrs. George Pring—white

Panama Pacific—rosy red to purple

Pennsylvania—deep blue

William Stone—blue

For most parts of California

Star Lilies, rose, purple, pink, red, and blue varieties

Zanzabarensis varieties in blue, dark blue, rosy-pink, and rosy crimson

Water lilies should be planted in pine boxes or pits in the bottom of the pool so the container will be at least 15 to 18 inches square and 12 inches deep. Larger containers will favor even better growth and better blooming. There should be about 18 to 24 inches depth from the surface of the water to the bottom of the container or about 8 inches minimum from the surface of the water to the crown of the water lily. A very rich mixture of two parts of loam and one part well-rotted cow manure is suitable for growing the water lilies. This mixture should have a handful or more of blood meal worked into it each spring to keep up the nitrogen and organic matter. Blood meal will not injure fish in the pool. Replanting of the water lily in new soil will be needed if this treatment is not given. Over the surface of the soil place 2 or 3 inches of sand so that the fish will not stir up the mud. Incidentally, coarse sand is beneficial to some fish for scouring the gills.

The hardy water lilies have fleshy roots, while the tropical water lilies have bulbs or condensed rootstocks. Some kinds of water lilies may be propagated from leaves, but root or bulb division is the method for all varieties here listed.

The only common pest on water lilies is an aphid which attacks the upper side of the leaves. This pest may be controlled by washing it off the leaves so that the fish can eat it. It may be necessary to repeat the treatment several times.

Very tender tropical water lilies, when grown in pools that freeze over, should be lifted in the fall and the bulbs stored away in moist soil until good growing weather comes in the late spring (about May 1). Dealers in water lilies will gladly give advice when requested to do so.

MISCELLANEOUS BULBS

Only a few of the many interesting bulbs can be mentioned. *Agapanthus* (blue lily-of-the-Nile), *Amaryllis belladonna*, *Hippeastrum* (hybrid amaryllis), *Crinum*, *Arum* species such as *Arum pictum* (black calla), and the true callas such as *Zantedeschia aethiopica* in white and *Z. rehmanii* in pink, are being grown in protected home gardens where there are no killing frosts. *Helicodiceros muscivorus* (*Arum crinitum*) has a bad odor. Most species of *Nerine* and *Orni-*

thogalum are tender but are found outside in a few gardens. Cannas are very important in the hot inland valleys in this state; over a dozen varieties are listed by some nurserymen. *Hemerocallis* (day lily) plants are often planted at the edge of pools. Herbaceous peonies are still being tried out and some varieties like Felix Crouse, Festiva Maxima, Mons. Jules Elie, and Sarah Bernhardt are successful, if watered and cared for well after the blooming season is past. *Tigridia pavonia* (tiger flower or Mexican shell flower) is fairly hardy and interesting. Various species of *Zephyranthes* should be grown more as low border bulbs. Watsonias will be greatly improved within a few years, and many new kinds of African bulbs will gradually become available. California has several specialists handling such bulbs and new reference books are being issued from time to time. Seeds of some bulbs may be obtained from South Africa at a nominal cost. The bulbs can only be imported under special permit, and most easily by the commercial growers.

HINTS ON GROWING DECIDUOUS FLOWERING CLIMBERS³³

A list of climbing plants is given on page 32. The present discussion will be confined to certain special kinds which present serious problems or with which it is important to give a list of varieties. The other vines may be planted according to the recommendations of nursery or landscape specialists.

CLEMATIS

The clematis does best in a light, loamy, well-drained soil, fertilized each winter with well-rotted barnyard manure. The soil should be limed if it does not already have plenty of lime. Never allow the plants to become dry.

The following varieties or species are important in home gardens of California:

- Clematis flammula* (plume clematis)—small, white flowers, fragrant; foliage semipersistent; needs full sun
- C. jackmani*—large velvety, purple flowers borne in profusion; like other large-flowered varieties needs full warm sun
- C. lawsoniana* var. *henryi*—large, creamy white; needs full sun
- C. jackmani* hybrid variety: Mme. Edouard André—large flowers of carmine-violet or bright red

³³ Includes both annual and perennial climbing or trailing plants. Climbing roses are included with other roses (p. 129).

- C. montana*—rapidly growing species with pure-white small flowers borne in the spring in great profusion
- C. montana rubens*—a variety of the above with pink on the buds, open with blush pink
- C. paniculata* (Japanese clematis)—a hardy climber with small white flowers on the upper portion, borne in late summer; should be pruned well in winter
- C. virginiana* (virgin's bower)—small, white flowers

WISTARIA

The genus *Wistaria* is represented by two important species, one from China and the other from Japan. The Chinese wistaria (*Wistaria sinensis*) has flower racemes 6 to 12 inches long, while the Japanese wistaria (*W. floribunda*) has racemes 2 to 4 feet long but with florets not so close together as in the Chinese species. Each species comes in white, blue or purple, and pink. Some varieties are much better than others within these listed colors; actual observation of the plants is needed to form a good idea of the particular variety. New colors are possibilities, for a yellow wistaria has been reported.

Grafted wistarias are recommended as being more vigorous and better suited to the ordinary home grounds. They should be planted in deep soil and kept well irrigated. The buds may be screened in the early spring if necessary to keep the birds away. Great damage is done by birds in outlying districts. Wistarias may be trained as standards or as regular vines. The greatest beauty is on pergolas where the blooms may hang down, but informal plantings are also pleasing on home buildings.

HINTS ON GROWING EVERGREEN CLIMBERS

The mild winter climate of California allows many gardeners to grow tender flowering climbers. Results are often rather uncertain; however, if the gardener wishes to do a little pioneering and conditions are promising, a few of the other less common vines listed may be tried. Certain nurseries make a specialty of the more tropical plants and will gladly give advice.

BIGNONIA

Evergreen climbers, commonly listed by nurserymen under the genus *Bignonia*, include the following popular species: *Bignonia capreolata* (trumpet flower), yellow-red and paler within, 2 inches

long; *Clytostoma callistegioides* (*B. speciosa*, *B. violacea*) (painted trumpet) lavender and streaked, 3 inches long and 3 inches across; *Doxantha unguis-cati* (*B. unguis-cati*, *B. tweediana*) (catsclaw) bright yellow, throat with orange, 3 inches long and 4 inches across, tendrils hold to stone or concrete; *Phaedranthus buccinatorius* (*B. cherere*) (red trumpet vine) blood-red, yellow at base, 4 inches long; *Pyrostegia ignea* (*B. venusta*) (flaming trumpet) crimson orange, 3 inches long.

BUGINVILLEA

Buginvillea vines are very gaudy when in bloom, but the magenta bracts of the more common variety have failed to please some gardeners. The newer brick-red variety, Crimson Lake, is much more satisfactory. The color is almost pink in the greenhouse.

HARDENBERGIA

This climber bears small, pea-shaped flowers in the winter or early spring. Colors range from violet-blue to light purple, pink, and white in the different varieties available. The vines hold by tendrils.

JASMINE

Jasminum floridum is a new golden-yellow species. *J. humile* is the well-known Italian yellow jasmine. *J. officinale* is the common white jasmine or jessamine.

SOLANDRA

Solandra guttata, or cup of gold, is a tall, vigorous scandent shrub reaching a height of about 12 feet. The flowers are golden-yellow, and as much as 6 to 8 inches across. The plant does well in sunny, protected spots as far north as central California. The plants should be watered freely from fall to early spring, for during this period the bloom is formed. Blooming is best in a sandy loam rather than a very rich soil. Very rank growth seldom develops satisfactory bloom. *Solandra grandiflora* has white flowers.

STAR JASMINE

(*Trachelospermum jasminoides*)

Trachelospermum jasminoides (*Rhynchospermum jasminoides*), or star jasmine, is often listed with trailers but remains shrubby for many years. It is very desirable for its fragrant, white, star-shaped blooms, and the plant is hardy in most coastal areas of California.

TECOMAS AND RELATED PLANTS

Pandorea australis (*Tecoma australis*), or wonga wonga vine, is another of the tall, half climbers with panicles of yellowish-white, bell-shaped flowers, spotted violet in the throat. The plant is limited to the frost-free areas. Another plant listed as *Tecoma mackenzii* is the same as *Pandorea ricasoliana* and has light-pink tubular flowers, striped red. This species must be planted in the full sun to flower well. Flowering may not start until the plant is five years old, a difficulty to be found in some of the similar woody climbers which at first make a very rank growth. Tecomas do best planted on arbors by themselves.

Cape honeysuckle (*Tecomaria capensis* or *Tecoma capensis*) is a half climber or shrub valued for its red, tubular flowers that appear in the fall and winter. It does best with good soil and a south exposure.

HINTS ON GROWING POPULAR DECIDUOUS SHRUBS AND TREES³⁴

FLOWERING CRAB APPLE

(*Pyrus*)

These may be considered either deciduous shrubs or trees. Young plants may be pruned as shrubs for several years but most kinds of flowering crabs become large trees in time. Gardeners will not be likely to have any particular trouble in growing the flowering crab apples, but it is important to know a little about some of the more popular varieties. The varieties are really very distinct in the beauty, shape, and size of their flowers and can hardly be compared directly as to merit. Each has its own glory.

Bechtel's Double-Flowering Crab is a variety of *Pyrus ioensis* that appeared in the Middle West. The flowers are extremely large, double, soft pink, resemble a rose, and are fragrant. It leads in its class.

Many growers find the smaller-flowered Japanese varieties equally fascinating. Anyone who has grown the Japanese flowering crab apple known as Kaido (variety of *Pyrus micromalus*) realizes that the crimson-stained pink flowers and the arching stems place this

³⁴ Includes those shrubs and trees which drop all of their leaves in winter. In a few plants, like the hydrangea, parts of the leaves may remain throughout the winter in frost-free areas. Such plants may be termed semi-deciduous but are included here. For azaleas see page 139; for hibiscus see page 145.

flowering shrub in a class by itself. The older species known as *Pyrus pulcherrima* (*P. floribunda*), showy crab, has bright-pink buds which open to almost white. *Pyrus scheideckeri* makes a small tree and bears red buds which open into small, double, bright rose-colored flowers borne in profusion. *Pyrus spectabilis* (Chinese flowering apple) has a spreading habit and makes an excellent display with its bright pink flowers. Still other flowering crab apples will be listed by nurserymen.

Crab apples may be readily grafted on any of the seedling apple stocks about the last of February or early in March.

The oyster shell scale and the woolly apple aphid sometimes are serious on the crab apple. The usual miscible oil emulsion sprays should be applied during the dormant season. Thorough application is essential where these pests occur.

FLOWERING PEACH, PLUM, CHERRY, APRICOT, AND ALMOND (*Prunus*)

These flowering plants have not been used as much as they really deserve. The landscape gardener tells us that evergreens may be grouped with them to provide a pleasing garden effect after the spring bloom of the deciduous shrubs or trees is past; this suggestion may aid some growers who have objected to the rather short blooming period of the flowering deciduous trees. The varieties now listed by California nurserymen are so varied that only garden space and money will limit the choice.

The flowering peach (*Prunus persica*) comes in double red, pink, white, and cerise and there are also singles, if desired. Cerise is often seen in gardens but softer pinks may blend better with other flowers; however the cerise varieties bloom so early that they can often be used without any serious clash in the garden. Some kinds of light pinks do not burn and are highly satisfactory. Gardeners should see the flowering peaches before making a choice of color. Nurserymen will gladly make recommendations. Peach leaf curl is the only common disease of the peach. It requires spraying with bordeaux mixture just before the buds open in the spring.

The flowering plums are widely grown, particularly the purple-leaved plums. *Prunus cerasifera* var. *pissardi* with its purple foliage is more of a foliage plant than a flowering plant, but *Prunus cerasifera* var. *blirieana* has double blooms of a darker pink and is very satisfactory for early spring bloom. The tree of the latter variety is less upright.

The flowering apricot (*Prunus mume*) with either double or single flowers is only grown to a limited extent but is well adapted to California gardens.

Flowering almonds are of two general types. The large trees belong to *Prunus triloba*; and the variety *plena*, a double-flowered form, is the one commonly seen. Some consider the single-flowered variety better. A very distinct species of flowering almond is *Prunus glandulosa*. It is also called dwarf flowering cherry. The double pink to white flowers and the dwarf habit of the plant remind one more of *Spirea vanhoutti* than of an almond or a cherry.

The Japanese flowering cherries are worthy of a much wider use. Their scarcity and cost have prevented many gardeners from using them, and it is impossible to import them from Japan or eastern nurseries because of the Oriental peach moth. Fortunately one or more of our California nurserymen are specializing in the growing of the flowering cherries, and still better, are using the real flowering cherry stock on which to propagate. Trees on suitable flowering cherry root are already available in excellent named varieties and at a reasonable cost. Trees on Mazzard root may do very well where the other roots are not available.

There has been some confusion in the names of standard varieties of flowering cherries, but the following varieties being grown and listed in California have been carefully checked and synonyms are given so that the characteristics may be better known. Careful nurserymen will be able to supply trees under these names.³⁵

Prunus serrulata

Kwanzan (Kanzan, Sekizan, Sekiyama, Kawazan)—double, dark, pink, late; strong upright grower
Shogetsu (Superba)—double, soft pink, late

P. serrulata var. *sachalinensis*

Fugenzo (James Veitch, Kofugu)—light, rose-pink, spreading, double flowers in clusters of three
Yamazakura—late, double, light pink, dwarf

P. lannesiana

Ariaka (Oriaki)—semidouble, light pink, sweet-scented
Gioiko (Gyoiko, Gyiko)—semidouble, pink
Minakami—light pink, semidouble, large tree
Miyako—double, soft pink, dwarf
Senriko—soft pink, drooping, large flower clusters
Takinioi (Cataracta)—single white, sweet-scented, large spreading tree
Yedozakura (Nobilis)—late, double, light pink, dwarf

³⁵ For a good check list of Japanese cherry varieties, see: Russell, Paul. Japanese flowering cherries. U. S. Dept. Agr. Cir. 31:1-8. 1928. (10 cents from U. S. Supt. of Documents, Washington, D. C.)

P. sieboldii

Naden (Nadan, Siebold cherry)—very double, light pink

P. subhirtella

var. *ascendens*—upright, light pink rosebud

var. *autumnalis*—light pink, early rosebud

var. *pendula* (weeping cherry)—rose-pink, pendulant branches; top grafted

P. grandiflora lutea—semidouble, green flowering*P. yedoensis* var. *taizanfukum*—double, light pink, upright grower*P. campanulata* (red-flowering cherry)—single, deep rose or red, bell-shaped flowers, tree about 25 feet, not very hardy in north

HYDRANGEA

Hydrangeas have long been admired in California as semideciduous or evergreen shrubs near porches and steps where there is plenty of shade and moisture enough to maintain a vigorous growth. Stunted plants will not develop good flower trusses. Practically all of the hydrangeas grown in California are varieties of *Hydrangea opuloides* (*H. hortensis*) and fall mostly into the Hortensia group. Some of the French varieties in this group are becoming very popular, as for example Trophee. There are no serious diseases or pests. An acid soil tends to give blue flowers while an alkaline soil will produce pink flowers with the same variety. Popular varieties include:

Domotoi—when well grown this variety is double-flowered, pink; some florets may come single if the plants are given little care

Radiant—deep pink

Trophee—an excellent new reddish-pink variety with notched petals in the florets

Thomas Hogg—a well-known white variety suited for pot culture

Many other varieties will be found listed by nursery specialists

ROSE³⁶

A home garden is hardly complete without a few roses. Some home gardeners add at least one new rose a year; the interest thus sustained makes home gardening a continued pleasure. Roses do require fertilizing, pest control, and careful pruning, but few garden plants give more garden color or more cut flowers for the home. The sentiment attached to roses cannot well be replaced by any other flower. Rose growing in California is very different from that in some colder climates and some varieties act differently here. A few brief suggestions will aid in securing good blooms.

³⁶ For a general discussion see: Mulford, F. L. Roses for the home. U. S. Dept. Agr. Farmers' Bul. 750:1-38. 1922.

The first rose plants are available at nurseries along toward Christmas and a second shipment comes in January or possibly a little later. In the milder parts of southern and central California the plants will push out buds early in January, if not before, so the nurserymen like to sell the plants before this time; otherwise the plants have to be potted up to hold them. After the roses are placed in pots or cans they can be held safely, but some root pruning is usually given the field-grown plants to make them fit the pots. Home gardeners should secure plants before the buds have pushed out if possible, in order to make the most of the long growing season. Roses planted in January and February will usually give the best results. Fall planting is practical provided plants are available and dormant.

There has been much debate as to whether roses should be budded on various stocks or grown on their own roots. Experience seems to show that those roses which are naturally vigorous on their own roots need not be budded. Most of the hybrid teas and many of the climbers do just as well on their own roots as when budded. The tea roses and weaker varieties in other classes should usually be budded on some congenial stock to insure vigor. The nurseryman usually prefers to put all his roses on stocks because budwood of new varieties goes further. The trouble with some budded roses is that the stock has not been properly disbudded before rooting and consequently the suckers that come up later may strangle the top. It makes little difference whether Mannetti, Ragged Robin (*Glorie des Rosomanes*), multi-flora, *Rosa rugosa*, or other stock is used, so long as the union is good and a good plant results. Nurserymen use what they consider most practical. The wholesale rose producers can be depended upon to use the best stock, for their whole future depends on results.

After the roses are set in the home garden the owner can increase his plants by cuttings if this is found practical, as it is with most of the varieties now grown. Growers of greenhouse roses often graft green plants in February and March, but this commercial aspect will not be taken up, for few home gardeners have greenhouses. A veneer graft can be used on small, green, rooted cuttings. Most home gardeners will find it far more practical to propagate from cuttings (fig. 8) in December or to bud rooted cuttings in June or August, the latter date for dormant buds to be forced out the next spring. Rose budding is not difficult. Special rose stocks like IXL are being used for some of the standard or tree roses. If tree roses are to be formed, the shoots should have grown a foot or more above the point where budding is to be done so that the wood will be in proper condition for working.



Fig. 26.—The rose in bud is justly popular. Most of the choice varieties of the present day have long pointed buds like the Feu Joseph Looymans buds shown above. (Photograph by courtesy of Armstrong Nurseries.)

Dormant budding about August is preferred for the tree roses. Three to five buds are inserted about the stem at suitable intervals.

The selection of rose varieties is largely based on the tastes of the grower, although some roses seem to be universally liked. But many of the excellent old roses of twenty-five or thirty years ago have been largely discarded because gardeners are continually on the search for something new. That explains why the varieties that are popular are rarely over five to ten years old. There are exceptions, as the planting list will show. Hundreds of new roses are being introduced each year; many of these will fall by the wayside as inferior in doubleness, resistance to mildew, strength of necks, shape and color, or in one or more of the other essential points. A rose that blooms a long time, is vigorous in habit, practically free from mildew, and resistant to aphids, has attractive foliage, produces a long, pointed bud, (fig. 26) holds its shape well, matures into a flower pleasing in color and not too single (except where entirely single), and is easily propagated and readily available, will most likely remain popular. Some roses fade badly or are too variable to be desirable. Many climbing roses have been developed from bush roses. Some of these fail to retain their climbing habits or do not climb readily, while others are very dependable. Caution is therefore needed to avoid mistakes in choosing new varieties. The roses listed below do not include all the meritorious roses, but those mentioned have been observed and tested under California conditions and are well worthy of consideration. Before naming the varieties it might be explained that the tea roses (indicated by *T.*) have a tea fragrance and as a rule are weak growers. The hybrid tea (*H. T.*) roses have more vigor. The pernettiana roses originally came by crossing the modern roses with the Austrian Copper, giving the well-known highly colored golds and salmons, but recent breeding makes it difficult to separate the pernettianas from the hybrid teas so the two are listed together. Only a very few hybrid perpetual (*H. P.*) roses are grown now; they are vigorous like the hybrid teas and are long blooming. The polyanthas (*Poly.*) include the baby roses, either multiflora or the hybrids. Noisettes, briars, moss roses, and other classes are occasionally seen but are not important as a rule. *Rosa wichuraiana* and its hybrids (*H. W.*) are often grown and along with the Cherokee roses are important for one crop of spring bloom. Odd species like *Rosa banksiae* are little planted. The Ragged Robin already mentioned as a stock is still grown extensively in southern California as a hedge along highways and around orchards near highways.

White or nearly white

Bush:

- Frau Karl Druschi (H. P.)
- K. A. Victoria (H. T.)

Climbing:

- K. A. Victoria (H. T.)
- Silver Moon (H. W.)

Yellow and orange

Bush:

- Constance (H. T.)
- Eldorado (H. T.)
- Golden Emblem (H. T.)
- Independence Day (H. T.)
- Irish Fireflame (H. T.), single
- Lady Margaret Stewart (H. T.)
- Mrs. E. P. Thom (H. T.)
- Rev. Page-Roberts (H. T.)

Climbing:

- Constance (H. T.)
- Golden Emblem (H. T.)
- Emily Gray (H. W.)
- Star of Persia (hybrid *Rosa foetida*); hardy

Cream, light yellow, and apricot

Bush:

- Golden Ophelia (H. T.)
- Lady Hillingdon (T.)
- Mrs. Aaron Ward (H. T.)
- Sunburst (H. T.)
- Sunstar (H. T.)

Climbing:

- Marechal Niel (Noisette)
- Mrs. Aaron Ward (H. T.)
- Sunburst (H. T.)

Light pink

Bush:

- Caroline Testout (H. T.)
- Mme. Butterfly (H. T.)
- Mrs. W. C. Egan (H. T.)
- Mrs. W. C. Miller (H. T.)
- Ophelia (H. T.)

Climbing:

- Bell of Portugal (hybrid *Rosa odorata* var. *gigantea*)
- Caroline Testout (H. T.)
- Cecile Brunner (Poly.)
- Dr. Van Fleet

Mme. Butterfly (H. T.)

Mary Wallace (hybrid Van Fleet)

Tausendschoen (*Rosa multiflora*)

Pink with copper and buff shades

Bush:

- Betty Uprichard (H. T.)
- Etoile Luisant (Baby Herriot) (Poly.)
- Isobel (H. T.); single
- Los Angeles (H. T.)
- Mme. Edouard Herriot (Daily Mail) (H. T.)
- Padre (H. T.)
- Talisman (H. T.)
- Wm. F. Dreer (H. T.)
- Wm. Kordes (H. T.)

Climbing:

- Jacotte (H. W.)
- Mme. Edouard Herriot (H. T.)
- Los Angeles (H. T.)

Dark pink and rose

Bush:

- America (H. T.)
- Dame Edith Helen (H. T.)
- Mrs. Chas. Russell (H. T.)
- Mrs. Henry Bowles (H. T.)
- Radiance (H. T.)
- Rapture (H. T.)
- Rose Marie (H. T.)

Climbing:

- American Pillar (H. W.)
- Cherokee, Pink
- Rose Marie (H. T.)
- Exeelsa (H. W.)

Red

Bush:

- Hoosier Beauty (H. T.)
- John Russell (H. T.)
- Kitchner of Kartum (H. T.)
- Lord Charlemont (H. T.)
- Pres. Herbert Hoover (H. T.)
- Red Radiance (H. T.)
- The Queen Alexandra (H. T.)
- Ulrich Brunner (H. P.)

Climbing:

- Hoosier Beauty (H. T.)
- Red Radiance (H. T.)
- Paul's Scarlet (H. W.)

Nursery roses are usually sold when two years old. They should be carefully graded according to size and condition (fig. 27 *A*). Some of the roses sold at cut rates are inferior in one or more respects, often having a poor bud union, sometimes very poorly shaped, small in size, or even untrue to name. It pays to buy from reliable rose growers or their responsible agents and pay enough to justify a legitimate business. Nothing can correct inferior roses and only reliable dealers replace roses that have been incorrectly named. Green rose plants should not ordinarily be purchased with bare root, for few home gardeners will have success with them. Rooted slips should not be transplanted until they are at least a year old.

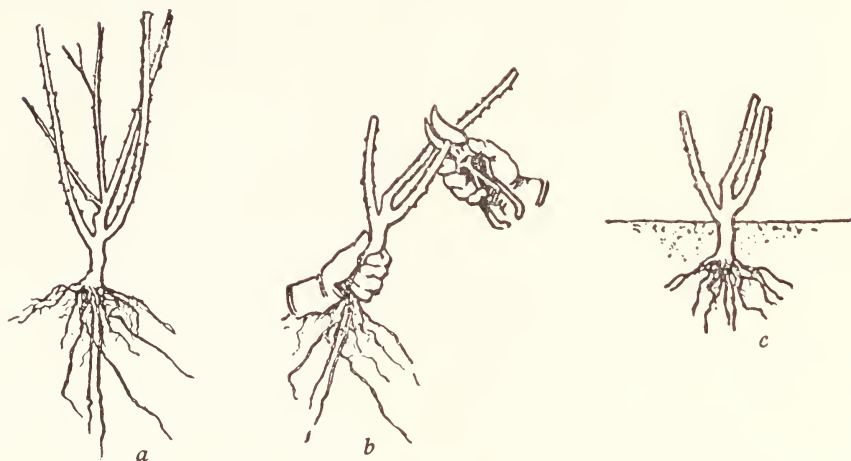


Fig. 27.—*A*, A good two-year-old field-grown rose as it comes from the nursery should have strong roots and several branches, and should never be badly dried out. *B*, Not more than three strong canes should be retained, and these canes, as well as the roots, may be shortened somewhat. *C*, After the rose bush is pruned it should be set at the proper depth, as shown in the sketch. (Sketches by courtesy of California Nursery Co.)

The rose should be planted in a hole that will allow the roots plenty of room. It is a mistake to cramp the roots or to plant in a hole that has poor drainage. Any broken roots should be cut off and any suspicious galls should be entirely removed. The rose bush should be set down to the first fork so that the bud union will be covered. Tree roses should be planted at about the same depth as in the nursery, allowing for some settling (fig. 27 *C*). The soil should be firmed about each plant with the foot, but not enough to injure the roots. Watering at planting time is advisable. If a rose bush should arrive badly dried out, the whole bush should be left in water over night. If the rose bush comes in a can the can should be slit down the side with tin snips and the ball of earth gently removed to the hole.

When the rose bush is dug in the nursery part of its root system will be lost, and therefore it is important to cut back the canes so that the roots will not have too much top to support until they have again established themselves. The nurseryman may have cut back the canes before shipping, but in many cases pruning has to be done after planting (see fig. 27 *B*). The canes should be cut back and thinned so there will be about three canes 6 or 8 inches long on a first-grade, two-year-old rose bush. All weak or slender growth should be taken out.

The subsequent pruning of roses is much more easily demonstrated than described. Short pruning, in which only two or three buds of the last season's growth are left, will be needed for most of the vigorous tea, hybrid tea, and hybrid perpetual bush roses. A few roses with much briar blood or with multiflora blood seem to be injured by severe cutting back. In such cases it is better to thin out the canes each year to admit light; the canes should be shortened only a little, cutting to good side buds. American Beauty, Cecile Brunner, the Pernet's, and Juliet are examples of varieties which should not be severely short pruned. All pruning should be done about December or January before new growth starts.

Climbing and pillar roses are also pruned while dormant after new growth has been completed, but the length growth is not cut back as a general rule. A very long cane might be shortened a little to insure healthy laterals and good flowers, but in most cases only the side branches or laterals on the long canes should be shortened. The pillar roses renew their canes each year and bear their flowers on the canes formed the past season; with these most of the old wood is removed each year. With the ordinary climbing roses, on the other hand, the old canes are replaced only every four or five years. In all these cases replacing canes should be developed so they will be ready by the time needed. All new canes not wanted should be removed each year, but it is a serious mistake to cut out all new canes and leave none for replacing the old ones when they have lost their vigor. Rank, sucker growth has to be shortened on many climbers; long new laterals on varieties like Climbing Cecile Brunner or Belle of Portugal may actually bloom much better the next year if cut back some early in the season. Pinching off the tips of these suckers will accomplish the same purpose. Apparently the new growth is slowed down and ripens its wood better for producing flowers the next year. The less vigorous growth may await the regular dormant pruning in winter. Laterals on climbers should be cut back in winter to two or three buds of the past season's growth. Any dead or unhealthy wood should be removed. Thinning out should be adequate to admit light and air to each

flowering cane. Mildew is worse where canes are permitted to shade each other badly.

The rose aphid, the green, bristly rose slug, and the rose snout beetle (*Rhynchites bicolor*) are the three most serious rose pests in California. Occasionally Fuller's rose beetle, the rose scale, and other insect pests may also be troublesome.

Early control is essential for rose aphid. This is easily accomplished by spraying with any of the good tobacco preparations, refined mineral oil sprays, or even hosing off with water, a strong hosing being most practical on climbing roses. Few of the plant lice ever get back. Birds also aid in control of rose aphid. Incidentally some roses, such as Silver Moon, seem to be less troubled with rose aphid, whereas others, such as Cecile Brunner, are badly attacked. There are two common kinds of aphid attacking roses—the larger rose aphid and the small, green rose aphid. The latter is the worst rose pest in many parts of California. It works throughout the summer.

The green rose slug is the larva of a sawfly³⁷ that has appeared in the San Francisco Bay region of central California and attacks the leaves so that only the skeleton is left after bad attacks. The brood which comes about July is particularly bad. However, control with a single application of lead arsenate spray early in the growing season is very effective.

The rose snout beetle is maroon red in color and has a long proboscis or nose. It sucks out the juice from the tender flower stems and the young buds, either causing the whole bud to wilt and die or else so ruining the bud that it is worthless. The adults normally hibernate in the soil beneath the rose plants, cultivation may therefore aid in control. Hand-picking during the hot part of the day while the insects work is surest of control. Hold the hand or spread a sheet beneath because the insects drop when disturbed. Spraying is not effective as a rule.

The rose scale is not serious on most bush roses but may be troublesome on some standard or tree roses where the old trunks remain for years. In such a case control is easy by spraying in the winter with one of the oil emulsion sprays, such as distillate emulsion. The summer oils could be used but are more expensive.

Rose mildew³⁸ is the only common and troublesome disease on roses in California. Mildew attacks certain varieties far more than others.

³⁷ See also: Middleton, Wm. Sawflies injurious to rose foliage. U. S. Dept. Agr. Farmers' Bul. 1252:1-14. 1922. (See p. 4 for the bristly rose slug.)

³⁸ For general discussion on rose diseases, see: Waterman, Alma M. Rose diseases. U. S. Dept. Agr. Farmers' Bul. 1547:1-19. 1928.

In buying roses it is best to select varieties that are known to be highly resistant to mildew. Those mentioned by growers as resistant to mildew include: Angele Pernet, Cecile Brunner and related Polyantha roses, Etoile de Feu, Golden Emblem, Golden Ophelia, Lady Margaret Stewart, Mabel Morse, Mrs. Aaron Ward, Mrs. Redford, Ophelia (and its sports such as Mme. Butterfly and Rapture), Radiance, Rev. Page-Roberts, Rose Marie, Shot Silk, and Silver Moon. Resistance to mildew is limited; a rose that is free from mildew in an open, sunny, well-ventilated place may be seriously attacked in a shady, poorly ventilated, moist situation, such as the north side of a house. If mildew does appear the gardener should be careful about wetting the foliage late in the evening. Sulfur dusts, liver of sulfur (potassium sulfate), and bordeaux mixture have been used but are troublesome to use and unsightly, and give only partial control at best. Avoiding mildew is the best practice where possible.

Rose rust, black spot, and crown gall are occasionally found on roses but no control is ordinarily needed, if good varieties are planted.

In growing roses proper watering and fertilizing are important. Roses should be fertilized with well-rotted barnyard manure or other organic fertilizer rich in nitrogen each year. Growers should not expect roses to be at their best unless a good mulch of barnyard manure is applied in the fall or spring and even a summer application will help to insure a good growth. The color of the flowers is much better when plenty of fertilizer is added. Liquid manures and soot water are often applied for forcing purposes. A rest in between the spring and summer crop of bloom is advisable. This is accomplished by avoiding heavy watering and fertilization between crops.

TREE PEONY

(*Peonia suffruticosa*)

With the exclusion of tree peonies (fig. 28) under United States Quarantine 37, plants can only be brought in under special permit. The Japanese and French varieties are scarce but are available in limited quantities. Most tree peonies in the United States are grafted on the roots of the wild tree peony, *Peonia suffruticosa*, often referred to by nurserymen as *Peonia moutan*. Nurserymen often mention various horticultural varieties such as *Peonia banksii* but these should be listed under *Peonia suffruticosa*, though they are distinct from the wild form in many ways. Roots of the herbaceous peony (mostly *Peonia albiflora* and a few *Peonia officinalis*) are occasionally used when roots of the wild tree peony are not available for grafting. Care

must be used to remove the root suckers where the wild tree peony is used as a stock so they will not strangle the top. Tree peonies may be planted in any fertile, well-drained soil in the full sun. They should be mulched or fertilized to keep up the vigor of the plants. Blooms up to 12 inches in diameter are being grown in California gardens. The identity of several excellent varieties has been lost.



Fig. 28.—The tree peony is hardy and usually better adapted to California conditions than most herbaceous peonies. The flower shown is *Peonia suffruticosa*, var. *banksii*, a large double pink variety developed from the species often known as *P. moutan* and commonly used as a grafting stock. This variety is common in old gardens. (Photograph by courtesy of Domoto Bros. Nursery.)

Some of these are being propagated by local nurserymen. The varieties listed below are being sold by name and have considerable merit. Other good varieties will become available in time, as stock is developed.

Asahi no Hikari—deep pink

Banksii—large, double, rose color (fig. 28)

Daikagura—double red, excellent, very large
Fugi Botan—pink, almost single
Kagura Jishi—good red
Komada Fugi—deep pink, nearly single
Nishiki Shima—pink
Yachiyo Jishi—very light pink, single

HINTS ON GROWING SOME OF THE POPULAR EVERGREEN SHRUBS AND TREES³⁹

In California evergreens should be selected so far as possible because the mild winters will allow such plants to grow and appear well the year around. Of the many evergreen trees and shrubs only a few supply important cut flowers or will be valued primarily for their bloom. In the case of evergreen trees there will be room for only a few in most home grounds. In deciding upon the selection and placement of these trees the advice of a competent landscape architect will be needed for large plantings, and the small home owner should secure the best advice he can afford.

ACACIA

Certain species, such as *Acacia baileyana*, *A. pravissima*, and *A. decurrens*, have been widely grown and are highly popular for their bloom, which appears early in the year, usually early in February, when flowers are welcome. A well-drained soil is needed.

AZALEA AND RHODODENDRON

These two beautiful hardy shrubs are divided by horticulturists on the basis of the size of the flowers, the large-flowered sorts usually being called rhododendrons while the smaller-flowered varieties are designated azaleas, though all are frequently listed under the genus *Rhododendron*. Rhododendrons are usually evergreen.

Some of the azaleas are hardy and some are deciduous. All will be considered here. Listing will be under the genus headings since nurseries use this method.

Evergreen azaleas for outside planting:

Azalea hinodigiri is probably a form of the species *robustum* and the variety *amoenum*, but is sold under the above name. It has small, bright-scarlet flowers which cover the bushy shrub in early spring. The variety is hardy in all parts of California, but prefers a shady, moist situation.

³⁹ An evergreen shrub or tree retains its leaves over winter. In certain cases (see azaleas and hibiscus) both evergreen and deciduous species may be involved, but for convenience both will be discussed here because the evergreen species are more important. Hydrangeas are discussed under deciduous shrubs and trees (p. 129).

Azalea huxleyi is a horticultural variety valued for its deep-scarlet flowers and its dwarf, evergreen habit.

Azalea kurume (*A. obtusum* var. *amenum*) is evergreen, with flowers in all colors.

Indian azaleas are very important for forcing for Christmas trade, but only a few varieties in this group do well outside.

Azalea ledifolia alba in white is fairly hardy and occasionally some of the pink-flowered forms do well in protected places in the garden.

Deciduous azaleas for the garden:

Azalea attaeclarensis has orange-colored flowers; it is a hybrid.

Azalea kempferi (*A. obtusum*) (torch azalea) has bright-orange flowers.

Azalea mollis is the trade name for varieties coming under *Azalea sinense* and *Azalea japonicum*. The colors are orange, or yellow, and salmon.

Azalea gandavense includes hybrids of *A. luteum*, known as Ghent azaleas. Many other azaleas are listed but the above include the more popular varieties.

The rhododendrons in Golden Gate Park, San Francisco, are well known to visitors. A collection valued at \$35,000 was recently donated to the University of California. California has a wild species that is frequently transplanted to home gardens. But it is safe to say that one variety—Pink Pearl—leads all others in popularity. It has a beautiful light-pink color and large flower trusses that are at their prime just before or about the first of May. If only one variety could be chosen this variety would be the one for most people. There are similar varieties but few equal it in color or size of the trusses. *Rhododendron californicum* is the native pink rhododendron. *R. catawbiense* of the eastern states has purple flowers. *R. formosum* has dark-lavender flowers. *R. ponticum* has lavender and purple flowers and grows rapidly. By properly selecting the varieties and species it will be possible to have blooms from February to May in outside gardens. *R. fragrantissimum* (Himalayan rhododendron) is prized for its fragrant white flowers.

Rhododendrons need a very well-drained, slightly acid soil. This requirement is easily met by planting in a soil mixed with German peat or oak leaf mold. Pine needles are useful in keeping the soil slightly acid and in good condition. Barnyard manure is not suitable because the ash is alkaline. An acid fertilizer like ammonium sulfate might be added if the nitrogen supply cannot be kept up by leaf mold and pine needles.

Watering is even more important than having the soil slightly acid. Heavy soils need to be lightened to insure good drainage. Water should be added often enough to keep the plants in good growing condition, especially through the fall and early winter when the plants might suffer. Buds for the next flower crop are being formed

at this time, and these flower buds may abort or fail to develop if the plants are neglected. A good mulch of leaf mold around each plant is helpful. Some gardeners plant small pines near to provide some protection from the sun and wind while the rhododendrons are small, later taking out the pines when more space is needed.

Rhododendrons and azaleas do not have any serious insects or diseases in the garden. The soil and moisture difficulties mentioned above will account for most failures.



Fig. 29.—The camellia is exacting in its moisture and temperature requirements but produces very beautiful flowers under the right environment. The popular variety, *Chandleri elegans*, is here shown. (Photograph by courtesy of Domoto Bros. Nursery.)

CAMELLIA

These well-known evergreen shrubs have recently received considerable attention among California gardeners and nurserymen. The plants are rather slow growing and there is much trouble about the buds and petals blasting, yet in spite of such trouble more camellias are being planted than ever before. Some very fine varieties are listed and there is no very good reason why more gardeners who like camellias cannot have success. The single varieties will give the least trouble about blasting of the buds but most people like the double-

flowered varieties best. Camellias like a warm, moist climate and a well-drained soil that has a good water supply. Unfortunately the moist north coast sections may be a little cool, and the warm inland gardens may be a little dry unless careful attention is given to irrigation. The Sacramento Valley finds camellias very satisfactory and in the annual flower show at Sacramento the camellia has been given prominence. Nurserymen in the Sacramento Valley and a few in the San Francisco Bay district have specialized in camellias.

A few of the many camellia varieties are considered superior. The Grandiflora type is receiving the attention of breeders, and gardeners who seek the best select varieties such as Chandleri elegans (fig. 29). This variety happens to be somewhat slow in growth but the blooms are very large, peony-flowered, light rose-pink in color. Approximately two dozen varieties are available at local nurseries. The variety Vallevareda is bright pink shaded lighter pink in the center. Hikari gangi is variegated. Warrata is deep crimson with peony center. Pink Perfection is pale pink. Rosita is extremely double and rose-pink. Nursery specialists will gladly describe others.

In planting camellias very cool, drafty situations are to be avoided. A camellia plant should never be permitted to suffer for moisture. A fertile soil is required, and enough organic matter should be added each year to keep the camellia in a vigorous condition. Shading the blooms a little during the blooming period may help to prevent sunburn. Blasting is apt to result if the petals or opening buds are wetted. A fungus trouble also attacks the flowers at times and may be discouraged by avoiding wetting, especially over night.

COTONEASTER

A home planting in California is hardly complete without cotoneasters, not because of their bloom but rather for their winter berries. There are many species used in landscaping home grounds, but the following are especially valued for their berries during the fall and winter.

- Cotoneaster pannosa*—tall with small clusters of medium-sized red berries which are mature at Christmas and New Year's
- C. herroveana*—similar to *C. pannosa* but the berries are a little smaller and not so compact in the cluster; probably less subject to the attack of aphid; excellent; sometimes seriously attacked by pear blight
- C. francheti*—orange berries borne scatteringly; in their prime about Thanksgiving when the color is popular for decoration

The only serious trouble to be controlled is pear blight, which sometimes attacks through the blossoms during May or June. Cutting

out all infected wood is the method of control often used on infected pear trees, and the same method is suggested for berried shrubs attacked by pear blight. All pruning tools should be disinfected. If the young shoots are attacked by aphids, they may be sprayed with tobacco or refined mineral oil sprays.

The upright cotoneaster should be pruned as the berried shoots are gathered. A judicious thinning out will be needed to favor good growth and to limit the size of the plants.

DAPHNE

Members of this genus are prized for the fragrance of their blooms, which scent the room or the garden nearby. The scarcity of the plants is also a factor with some people. Daphnes are being successfully propagated now in California and are worthy of a place in home gardens. A choice may be made from the following:

Daphne odora—includes white and deep-pink varieties, very fragrant

Daphne odora var. *marginata*—a pink-flowered variety with leaves edged yellow

Daphne oncorum—fine-leaved plant with many-flowered heads, pink, fragrant

Daphnes are very slow to root from cuttings except in the hands of skilled nurserymen. The nursery plants should be set in moderately fertile, rather heavy loam and not cultivated or irrigated too much. Full sun is best. A failure to bloom after two to four years is usually a sign of excessive watering and fertilizing or too much shade. Moderately cool weather, such as prevails near the coast in central California, has produced fine growth and good bloom. When pruning the grower should not remove all the flowering laterals, for it is on these that next year's crop is borne.

ERICA OR HEATHER

Heathers, like rhododendrons, require a slightly acid soil to do well. Never plant near a lawn that is heavily limed. If the soil is not neutral or acid, it may pay to add leaf mold, German peat, or acid-forming chemical such as commercial aluminum sulfate or powdered sulfur. An annual dressing with one of these chemical is desirable wherever the soil naturally contains much alkali or lime.

Only a few heathers are prized for their cut blooms, but many kinds are sold in pots for decorative purposes during the winter holidays. *Erica melanthera* is probably the hardiest, healthiest, and best all-round winter-blooming variety for home gardens. The new variety

E. melanthera rubra is slower in growth. *E. mediterranea* is an old variety valued for its lavender-pink blooms, but the plant is less free from insects than *E. melanthera*. *E. mediterranea hybrida* is much prized for bedding purposes because of its dwarf habit. *E. persoluta* (white) and its variety *rosea* (rose-pink) are excellent for the spring bloom. The tubular-flowered varieties are rarely satisfactory in the open garden, but persons wanting to make a trial might plant *E. felix faure* or other similar variety recommended by the local nurseries. Heathers should be cut back heavily after the blooming season is past to prevent the shrubs from becoming too tall.

ESCALLONIA

Several species of escallonia are prized in California because of their color effect in the garden and long blooming period. The escallonias are well adapted to most of California. Many good species are now available, among which are the following: *Escallonia ingrami*, crimson; *E. langleyensis*, pink; *E. montevidensis*, white; *E. pterocladon*, red; *E. rosea*, pink; and *E. rubra*, dark red. The plants will stand considerable shade and still bloom. They may be grouped with other shrubs for banking. They are not particular about soil or moisture but will respond to good care. They have no serious pests.

EUCALYPTUS

The eucalyptus as an ornamental is best known by such species as *Eucalyptus ficifolia* (the red-flowered gum) and *E. leucoxylon rosea* (pink-flowered gum). These trees are dwarf and are better adapted than are the taller species to small home grounds. They interfere less with other plants.

FUCHSIA

Outdoor culture of the fuchsia is important in many parts of California because so many districts are free from killing winter temperatures. The fuchsia will be killed if exposed long to temperatures running much below 30° F. Some varieties become nearly dormant, but under favorable conditions plants are evergreen. Growth is good in any ordinary, well-drained loam soil that is well supplied with moisture. Partial shade is highly desirable, and especially shelter from a hot afternoon sun.

Nearly a hundred years ago over five hundred species and varieties of the fuchsia were known. One of the present problems is to identify some of the popular kinds seen in gardens. A fuchsia society was

formed in 1929 to clear up the matter of nomenclature and to further interest in this valuable flowering plant. Individual nurserymen rarely list over five or six out of about a hundred varieties being grown in California home gardens. The following varieties and species are among those often listed or highly popular. Many others should be of interest to fanciers.

Large-flowered fuchsias

Autumnale—salmon sepals and scarlet corolla; leaves bronzed and flushed
Fuchsia corymbiflora—coryms of brilliant red flowers; requires support; a good climber

Graphic—scarlet sepals and deep-violet corolla

Phenomenal—double, bright-scarlet sepals and purple corolla, very large

Storm King—red sepals and white corolla, tube short, flowers very double

Sunray—scarlet sepals and light-purple corolla, leaves crimson-bronze and white

Swanley Yellow—coral-red, extra long tube, spreading sepals.

Small-flowered or baby fuchsias

Fuchsia magellanica var. *gracilis*—slender red flowers, graceful spraying foliage, rapid grower.

Fuchsia magellanica var. *riccartonia*—tiny red flowers, small curled leaves

Fuchsia microphylla—deep-red sepals and corolla, small leaves, autumn bloomer

Fuchsia procumbens—small orange-purple flowers, a creeping species

Fuchsia thymifolia—red flowers, petals wavy and obovate

Little Gem—small-flowered, almost pure white, flushed pink

HIBISCUS

In recent years the evergreen hibiscus (*Hibiscus rosa-sinensis*), often known as the Chinese hibiscus, has been planted rather extensively in frost-free areas of southern California and is listed by all leading nurserymen. The single red and double red are most common but colors include peachblow and single yellow. There should be ample heat as well as a freedom from killing frosts.

In frosty places it will be better to select *Hibiscus syriacus* or althea (rose of Sharon), a deciduous species that is hardy but planted to only a very limited extent in California. Colors include rosy red, double white, double red, blotched white, and crimson. The marsh mallow (*H. moscheutos*) and its hybrids are often listed by seedsmen and have been popular as herbaceous perennials.

HOLLY

(*Illex aquifolium*)

Recent publicity has created new interest in growing the English holly in California, but little hope can be held out for this beautiful berried shrub except in very favored locations, as may be found in the redwood belt or in small valleys near the coast with deep, fertile

soil well supplied with moisture throughout the year. Elsewhere the holly may grow well but in most cases fails to berry satisfactorily. At best it takes a long time to come into bearing. Those who plant English holly for the berries should select a proved named variety like the Van Toll, or Dutch holly, as it is sometimes called. These plants come grafted and any failure to berry can be attributed to the environment, whereas seedlings may never berry even with a good environment. Chinese holly (*Ilex cornuta*) has done very well and is listed by some nurserymen. The Japanese holly or false holly, *Osmathus aquifolium* (*O. japonica*) is similar in foliage but its fragrant white flowers readily distinguish it from the English holly. California holly is a name applied to the toyon, *Photinia*.

OLEANDER

(*Nerium oleander*)

The warm inland valleys of California find the oleander one of the very best summer-flowering plants. Named varieties include Dr. Golfin, large, single, deep rose; Gigantea, tall, fragrant, double rose; Madame Sarah Bernhardt, large flower trusses, white streaked pink; Mrs. F. Roeding, salmon, fringed; Nankin, good dwarf yellow; Sister Agnes, large trusses of pearly white.

Cuttings of the oleander start readily in water. The plants are often badly attacked by scale insects, so may require spraying with a refined mineral oil spray. The foliage is poisonous to children and livestock.

POINSETTIA

(*Euphorbia pulcherrima*)

The poinsettia will grow outside and bloom satisfactorily in all of the frost-free districts of California. It will not stand much frost, but in some seasons there are no killing frosts until after Christmas; in such seasons, with a little covering at night, the plants may bloom successfully even with a little frost later. The frosted tips may be cut back and new growth forced out about June. The best time to take green cuttings for winter blooms is in June. The green cuttings from new growth are preferred to the old hardwood cuttings. Young rooted cuttings should not have the roots disturbed; it is advisable to grow them in individual pots and later transplant them to other pots or to protected spots in the garden.

There are three varieties, but only one of these is common. The scarlet-flowered, single variety is most popular and is the only one handled by most nurserymen. A double scarlet and a pink-flowered variety are occasionally grown.

PYRACANTHA

Pyracanthas or firethorns are valued for the berries which come when flowers are scarce. *Pyracantha lalandi* with its orange berries is at its best about August. Then *P. crenulata* with red berries comes in early winter or late fall, but few of the berries are left by the birds. *P. angustifolia* is beautiful with its dense clusters of orange berries about Christmas and New Year's, but unfortunately this species is very subject to pear blight and should never be grown where pears are important commercially. In any case this species should not be planted in pairs because if one plant should be killed by blight the symmetry of the planting would be spoiled. *P. gibbsi yunnanensis* in orange-red and *P. formosiana* in red are excellent new species which ripen their berries in midwinter. Birds do not like the last three species very well.

VERONICA

Several species of veronicas are available for landscaping and give a very quick effect, but few of these are valued for flowers in the home. *Veronica hulciana* is very fine for cutting. The flowers of pale soft lilac are borne on long, slender stems in the spring and are very different from the more common species. The prostrate or dwarf species are now very popular as edgings in rock gardens. *V. teucrium* var. *prostrata* (*rupestris*), bright blue; *V. repens*, pale lilac; and *V. pectinata*, deep blue, are good examples of the low-growing, bright-colored varieties.

MISCELLANEOUS EVERGREEN TREES

Other evergreen trees which are listed by many nurserymen and may be used include: *Jacaranda ovalifolia* (*J. mimosaeifolia*), valued for its large trusses of blue flowers; the large-flowered magnolia (*Magnolia grandiflora*); and the pepper tree (*Schinus mole*), valued for its red berries. Most of these trees are shallow-rooted, gross feeders and injure all but the hardiest plants.

NATIVE EVERGREEN SHRUBS

California gardeners should not forget the many excellent native flowering shrubs. It would be possible to build a very respectable garden with only native shrubs and flowering plants. At least gardeners should not omit the more promising kinds and should encourage nurserymen to handle these. Unless there is a dependable demand, nurserymen cannot afford to handle any plant, regardless of its merits.

Some of the native evergreens which either are popular, or should be, include: *Arbutus menziesi* (madrone); *Arctostaphylos standfordiana* and other species of manzanita; *Carpenteria californica*; *Ceanothus arboreus*, *Ceanothus cyaneus*, and *Ceanothus purpurea* of the popular ceanothus (wild lilac); *Fremontia mexicana*; *Photinia arbutifolia* (toyon); and such species of *Rhus* as *R. integrifolia* and *R. laurina*. Some nursery firms specialize in these native plants and can add to the list just mentioned. Difficulties in transplanting have prevented them from being used more.

THE RELATION OF HOME FLORICULTURE TO LANDSCAPE DESIGN

The growing of flowers in home gardens should never be separated from good landscape design. This publication has devoted itself to the selection and growing of flowering plants, but the arrangement of these plants is very important. Flowers in a home garden should be arranged for color harmony, harmony of texture, good skyline, and succession of bloom. There should be a proper combination of flowering plants with other ornamentals. Such problems belong to the landscape designer, and are beyond the scope of this circular. A few suggestions on color harmony in flowers will be offered, however, and may be supplemented by experience and good taste on the part of the gardener.

COLOR HARMONY IN THE FLOWER GARDEN

Most people sense pleasing color harmonies in flowers without stopping to reason why. Harmony is secured by using similar colors or pleasing contrasts. When the colors seen in the spectrum or rainbow are arranged into a circle (fig. 30), the elementary colors—red, orange, yellow, green, blue, and violet—naturally have opposites, for example, red and green, orange and blue, yellow and violet. White is without color and true black does not occur in flowers.

If black is added to the clear colors a shade is obtained. If white is added a tint is obtained. For example, yellow with black gives old gold or with white gives sulfur. Red with black gives cardinal red, or with white, pink.

It is advisable to use very similar colors in a planting or a bouquet, or else a color close to opposite but not exactly opposite. For example, orange is the opposite of blue but most people prefer a contrast of blue and gold, or else a shade of pink with the blue. California

poppies and *Nemophila* (baby blue-eyes) would illustrate the former, blue marguerites (*Felicia amelloides*) and Cecile Brunner roses the latter combination. A shade of the contrasting color may be preferable, such as red with old gold, or possibly tints, such as light pinks with golden yellows. A subdued color will usually be needed with an intense color, if any combination is attempted. It is important to be careful with similar colors. Some reds with pink are normally objectionable. Even salmon pink and cerise pink are not harmonious alone. It becomes necessary to choose wisely and in many cases to introduce neutral colors or peace-makers, such as white or green, to separate objectionable contrasts. Often this trouble may be partly avoided by using a great variety of colors so the eye will not rest on just a few poor combinations. Again it is possible for the tints or shades of one flower to gradually blend into those of adjoining flowers so that the general effect is pleasing.

Segregation is safest for the beginner. Difficult colors like the magenta in *Buginvillea spectabilis* may be segregated by screening with green.

The season of blooming should be studied in connection with color harmony; otherwise the prevailing color of an early planting may hold over to disrupt the harmony of a later planting.

These brief suggestions will call attention to the problem. The color wheel shown in figure 30 can be used as a partial guide in avoiding trouble. White, green, gray, and the colors approaching black may be combined with almost any color. Popular color combinations include the following:⁴⁰

Blue and brown	Crimson and gold
Blue and gold	Crimson and yellow-green
Blue and pink	Crimson and purple
Blue and straw-color	Crimson, orange, and green
Blue and salmon	Crimson, blue, gold, and green
Blue and orange	Purple and yellow
Blue and yellow	Purple, scarlet, and gold
Blue, scarlet, and purple or lilac	Lilac and deep gold
Blue, brown, crimson, and gold or yellow	Lilac and primrose
Blue, crimson, and orange	Lilac, crimson, and gold
Blue, purple, scarlet, yellow, and black	Lavender and pink
Red and gold	Lavender and pale blue
Red, yellow, and black	Violet and orange-yellow
Scarlet and violet	Violet and blue-lilac
Scarlet, blue, and white	Orange and gold-orange
Scarlet, blue, and black or yellow	

⁴⁰ Some of the terms used may require further explanation. Black is used to designate a shade that is popularly called black as in a very dark pansy or black calla. Brown is usually a shade between black and red, or yellow. Lilac is light purple. Lavender is paler than lilac. Cerise is cherry color. Mauve is mallow pink. Many other such terms are in use and will be defined in the dictionary.

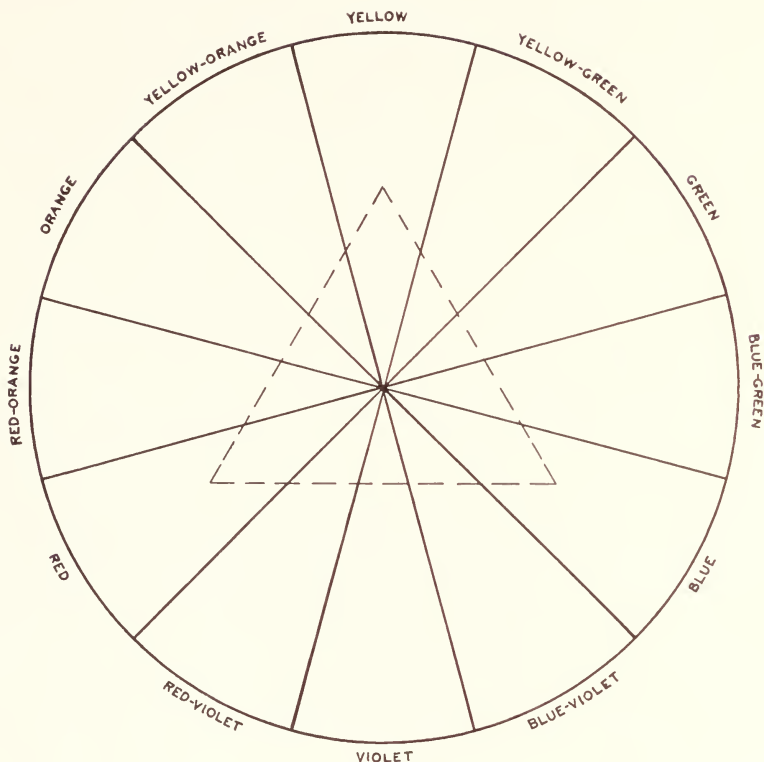


Fig. 30.—The color wheel. Like harmonies may be classified as (1) neighboring harmony, produced by colors located side by side on the color wheel, such as blue-violet, violet, and red-violet; (2) alternate neighboring harmony, produced by combining every other color on the wheel, such as yellow-green, blue-green, and blue-violet; and (3) self-tone harmony, produced by shades or tints of the same color, such as light and dark blue.

Contrasting harmonies may be classified as (1) complementary harmony, produced by two colors located directly opposite from one another on the color wheel, such as yellow and violet; (2) neighboring complementary harmony, produced by adding to the colors in a complementary harmony the neighboring colors of one of the complements, such as yellow and violet plus red-violet and blue-violet; and (3) triad harmony, made up of three colors located by revolving the triangle on the color wheel—red, yellow, and blue, for example.

THE DEVELOPMENT OF THE HOME FLOWER GARDEN

The owners of beautiful gardens can usually look back to a time when they were just beginning and just becoming interested. Many influences probably helped them toward success. The gift of some new plant material from a neighbor, a visit to a well-arranged home garden, a visit to a flower show, a lecture in a garden club meeting, an article in a floral magazine, or a list of novelties in a seed catalog may have given them suggestions for improving their gardens. New ideas should be welcomed at all times. New flowers, new methods, and new people are constantly coming to each neighborhood.

Some improvement in the garden should be noted each year. At first interest may center in the plant itself, then follows the arrangement of the plant for a good garden effect, or a good effect in the home; finally the home garden is equipped for greater comfort and ease. These are normal steps in progressive home floriculture. The garden should be made for enjoyment, both by the family and neighbors.

Home gardeners should cultivate a neighborly feeling in the community and encourage others to improve their gardens. There is no greater unifying element in a community than the common endeavor to improve homes and gardens. Home pride developed through the growing of flowers naturally leads to civic pride, and the whole community and state is better for the endeavor.

ACKNOWLEDGMENTS

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266. Analyzing the Citrus Orchard by Means of Simple Tree Records.

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269. An Orchard Brush Burner.
270. A Farm Septic Tank.
273. Saving the Gophered Citrus Tree.
276. Home Canning.
278. Olive Pickling in Mediterranean Countries.
279. The Preparation and Refining of Olive Oil in Southern Europe.
282. Prevention of Insect Attack on Stored Grain.
287. Potato Production in California.
288. Phylloxera Resistant Vineyards.
290. The Tangier Pea.
294. Propagation of Deciduous Fruits.
295. Growing Head Lettuce in California.
296. Control of the California Ground Squirrel.
301. Buckeye Poisoning of the Honey Bee.
302. The Sugar Beet in California.
304. Drainage on the Farm.
307. American Foulbrood and Its Control.
308. Cantaloupe Production in California.
310. The Operation of the Bacteriological Laboratory for Dairy Plants.
311. The Improvement of Quality in Figs.
312. Principles Governing the Choice, Operation, and Care of Small Irrigation Pumping Plants.
313. Fruit Juices and Fruit Juice Beverages.
316. Electrical Statistics for California Farms.
317. Fertilizer Problems and Analysis of Soils in California.
318. Termites and Termite Damage.
319. Pasteurizing Milk for Calf Feeding.
320. Preservation of Fruits and Vegetables by Freezing Storage.